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BIOLOGY AND MEDICINE.[1]

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UNTIL I approached the task of composing a presidential address, I did not realize how many elements are or may be involved in such a responsibility. Every meeting of A.N.Z.A.A.S. is primarily a meeting of scientists, and the first requirement of a president's address is that it should be acceptable to his fellow scientists. It should convey to them the speaker's interest in his own branch of science and help to renew in them their sense of the importance of science in general. If possible, it should have sufficient breadth of interest to provoke ideas in other branches of science than that with which it deals.

We are, however, not concerned wholly with scientists. From the foundation of the British Association and its daughter societies like A.N.Z.A.A.S., the Association meetings have always served as pulpits from which the public can be offered enlightenment on the achievements of science, uplifted by promises of its future benefits or chastened by its warnings. The Press must always be an auxiliary of science if our work and our aspirations are to be understood. Any presidential address must be written with the realization that, metaphorically speaking, the Press is looking over the writer's shoulder.

In my own case I started first to write an account of influenza virus and its structure, with the general idea of illustrating how nowadays almost every variety of physical, chemical and logical technique must be brought to bear on each fundamental problem in biology. The difficulty here was simply that of developing this theme without introducing a mass of unacceptable technical detail. The next draft, which never got beyond a series of headings, was to use very much the same material, but in quite a different fashion—to start with the broad objective of medical research and to follow down the ladder of my own interests to the highly specialized field in which we are at present working. There are many different ways of stating the objectives of medical research; but few would quarrel with the claim that, humanly speaking, our aim is to make it possible to achieve for every human being the greatest measure of health and length of life that is allowed by his inheritance. But before we can understand the bearing of what we are doing here and now in the laboratories, the primary objective must be particularized and qualified in many ways and at many levels. Infectious disease is only one part of the medically significant impact of the environment upon the body. Amongst the parasitic organisms that produce disease we have worms, protozoa, fungi and bacteria before we come to the viruses, of which influenza has been the type chosen for study in our

[1] Presidential address, delivered at a meeting of the Australian and New Zealand Association for the Advancement of Science, New Zealand, January, 1957. This address is published simultaneously in *The Australian Journal of Science*, March, 1957.

laboratory. Influenza itself can be studied at several levels, clinical, epidemiological or experimental, and in the laboratory it may be influenza the disease or the virus as such in which we are interested. So it goes progressively to a more and more specialized level until, as in our laboratory at the present time, we are concerned with the nucleic acids of the influenza virus and the part they play in the synthesis of virus protein and the transmission of the hereditary characters of the virus. Then we find almost suddenly that we are not working in some tiny specialist's niche, but have been brought face to face with the most basic of all biological problems—the synthesis of protein of specific predetermined pattern by the organism. This is the key problem of both biochemistry and genetics. I believe that already my colleagues have provided from their work on influenza an important piece of the information that will eventually be fitted together like a jigsaw puzzle to give the answer, or—and this I am sure is more correct—the contemporary approach to an answer which can never be final.

That might have been an interesting theme to develop, but not in a presidential address. Any discussion of pattern in large biological molecules soon becomes very difficult to follow for those not specifically interested in such topics, and there is a second more important objection. In such discussions we tend to escape almost completely into a realm remote from human application. We must remember that theoretical understanding is not always needed for practical scientific success. It was possible to eliminate yellow fever from Cuba and Panama before it was known whether the germ responsible was a bacterium, spirochæte or virus, and I doubt very much whether knowledge of how nucleic acid and protein are interrelated in the poliomyelitis virus will ever have any bearing on the prevention or treatment of poliomyelitis. Only a small fraction of the knowledge that is being accumulated in the laboratories will ever be put to direct human service. This I know is a heresy; but it may be more acceptable if I add that when the unprecedented human problem arises in peace or war, the men who will be best fitted to develop a solution will be those who have pressed forward their subject "as far as thought can reach".

What was needed for the occasion tonight was clearly something that had real human relevance. For anyone whose main professional interest is infectious disease, there is a tale to be told of a hundred years' war against plague and pestilence that has ended in their almost complete control. With poliomyelitis now preventible, there is no major killing or crippling infectious disease which intelligently directed and adequate human effort cannot reduce to insignificant proportions. And like other victories this one has raised a greater human problem almost than the one it has eliminated—pressure of human over-population in the under-developed areas of the world. This is the most important political problem of today.

But the story of the conquest of infectious disease—the Pasteurian revolution—has been told many times. In one form or another I have elaborated the theme in books and several addresses—one at the Hobart meeting of A.N.Z.A.A.S. The problem of over-population in Asia, which is the currently important phase, is something for the demographer and the social psychologist to discuss. It is not an appropriate topic for a microbiologist, although I am certain that every biologist who has spent even a few weeks seeing and discussing medical work in India, as I did twelve months ago, will have a profound interest in the subject.

My final choice of a topic for this address was strongly influenced by the fact that it is more than fifty years since a president of the Association was a graduate in medicine. It seemed that this might be a suitable occasion for a biologist with a medical background to look at some of the current problems of medicine.

Medicine as Biological Science.

Medicine is many things—it is an art, a science and an expression of human compassion—it is an ancient and honorable profession, jealous of its status, its emoluments and its solidarity—and deeply conservative. When I look at medicine from the scientist's angle only, I am forgetting much of what is most important. Nevertheless, the practice of medicine is perhaps the most direct of all the channels by which the advance of knowledge is applied to human benefit. It is very hard to define science; but for most purposes I prefer to believe that it is the systematic exercise of human intelligence to find the most effective means of satisfying human needs and desires. Health and life are the basic needs of everyone, and other scientists are justified occasionally in wanting to know that medicine is making the best practical use of the intellectual and material weapons that science is providing.

What I am particularly concerned about, and what I think should be brought forward on such an occasion as this, are the medical problems that have not been dealt with effectively or are arising now as a result of the new conditions of our scientific civilization. It is inevitable that the major changes that have resulted from the virtual elimination of infectious and nutritional disease should bring into the foreground a different set of medical problems. The most obvious change is a direct result of the increasing average age of all civilized communities, with its special emphasis on diseases of old age, cancer being probably the most important. Closely related is the increasing importance of deaths in which genetic factors play a predominant part. In a very real sense the final objective of preventive medicine is that all deaths should result from the play of genetic factors only. With every success in eliminating the environmental causes of premature death, we shall see more and more clearly the influence of genetic constitution on health and length of life.

That influence is in fact evident already in our hospitals and our institutions for the mentally abnormal. Insanity and feeble-mindedness in all their degrees and manifestations nearly all have a genetic component, and often this completely dominates the picture. Mental illness is a matter of supreme importance, but it is something that I am not competent to discuss. If we confine ourselves to the general hospitals, we can cover a large proportion of serious illness under two heads: (*a*) cancer in all its forms; (*b*) premature degenerative disease, especially cardio-vascular.

Perhaps we can clarify some of the implications of medicine today by looking briefly at four typical patients to be found in any general hospital in the western world. The first, perhaps, is a man in his forties who has had a severe hæmorrhage from a duodenal ulcer, the second a woman of like age in hospital for a gall-bladder operation. The third is a man of fifty years with a chronic cough and an X-ray shadow suspected of being a bronchial cancer, while the fourth is a man of sixty years recovering from a heart attack (coronary thrombosis). Each of those patients presents two problems. The immediate task for the doctor is to bring the patient as quickly as possible back to the fullest level of health that circumstances will allow. Nowadays the treatment involved will be based very largely and rather directly on an attempt to remedy structural changes by surgery and functional change by appropriate drugs.

The second and far more difficult problem is to assess the factors responsible for the patient's illness. When we are dealing with cases like those I have mentioned, this side of medicine may not seem very important. The disease condition is clearly the end result of circumstances acting over many years which nothing now can alter. It is simplest to forget the past and make the best short-term compromise with fate that skill and knowledge can devise. But if we are looking at medicine as a facet of biological science or as an adjunct to the social effectiveness of the community, we must be interested primarily in the causes and prevention of ill-health rather than in the individual and immediate treatment of the patient.

For disease conditions like the four common forms we have mentioned, it is not easy to see how prevention can even be thought of. There is, however, one general

approach that I think every good physician consciously or unconsciously employs. If he is to appreciate the patient as a complete human being and to understand the causes of his disability, he must assess three aspects of the patient's illness. These may be classed as environmental, genetic and psychosomatic.

Environmental Aspects.

In nearly every illness there is some recognizable impact of the physical environment that has played a part in producing it. This aspect may be completely dominant, as when a mosquito injects the virus of yellow fever or a man is smashed in a motor-car accident; or it may be no more than an indication that cold weather has accentuated the symptoms of a peptic ulcer. In general, the more completely the cause of a disability can be related to the environment, the more readily is the condition prevented.

Genetic Aspects.

There are very great inborn differences in human beings which are quite obviously highly relevant to the types of illness from which they will suffer. Differences in physical build and temperament are mainly determined by inheritance, and their relative significance in relation to disease is a matter of current study, particularly by those influenced by Sheldon's ectomorph, mesomorph and endomorph classification. In many ways this is just a modern systematization of the old-fashioned doctor's insistence on the importance of his patient's "constitution" in determining his illnesses and his response to treatment.

Psychosomatic Aspects.

The influence of the mind on bodily disease is inescapable; in America at least the concept has passed into current slang—"giving the boss ulcers". Selye's doctrine of stress has had a very wide influence on medicine, and psycho-social stress is a very real one. Equally important to the doctor is an appreciation of the impact of illness upon the patient's mental and emotional life.

Orthodox medicine is still concerned especially with environmental causes of ill-health and with the application of anatomical and physiological principles to remedy it. It is in this general field that the major successes of both preventive and curative medicine have been achieved. Psychosomatic medicine is gradually overcoming the initial hostility that was perhaps mainly due to the over-enthusiasm of its proponents, while genetics still remains little regarded.

The Major Problems of Today.

In a lecture I gave at the Melbourne meeting of A.N.Z.A.A.S., I spoke about the future of preventive medicine, concentrating particularly on those diseases whose incidence was actively increasing at the present time. These were dental caries, cardiovascular disease (especially coronary occlusion), and two forms of malignant disease, leuchæmia and cancer of the lung. All of these are under active study at the present time, and in regard to the three killing diseases, the picture is becoming progressively clearer. All three seem to be related to significant changes in our ways of life.

Coronary disease, the typical cause of death in our countries for men in the professional and executive classes between the ages of forty-five and seventy years, is not so confidently ascribed to worry and stress as it was a few years ago. At the present time opinion seems to be steadily growing firmer that coronary disease might be made much less common by a reduction in the food intake of saturated fats (animal fats and hydrogenated vegetable oils) and in the amount of cigarette smoking. Impressive evidence in both directions has emerged in the last three years. It is still conceivable that chronic emotional stress plays a part, and it seems likely that there is a genetic factor, if only in regard to the difference between males and females. If the current opinion on the importance of diet is fully established, there is interesting scope for preventive work; but as *The Lancet* has recently pointed out, it is a very much more difficult matter to change people's food habits than to persuade them to have their children immunized against an infectious disease.

Lung cancer shows a steady and continuing rise in all civilized countries. In Australia the rise for males has been about 7% *per annum* for the last thirty years and shows no signs of diminishing. The relationship to excessive cigarette smoking has been fully established, but does not seem to be the whole story. There may well be aspects yet to be elucidated, but the present position seems relatively clear and can be summarized as follows.

There are two types of lung cancer which can be differentiated histologically; one is rare and is found equally in males and females; it does not appear to be significantly influenced by environmental factors. It is the second histological type which has increased so greatly in the last fifty years, and which is seven times as commonly seen in men as in women. The incidence of this type is sharply related to two environmental factors—(i) the intensity of cigarette smoking, and (ii) urban as against country life.

I do not know of any competent pathologist who denies the statistically established relation between the incidence of lung cancer and smoking habits. The association with excessive cigarette smoking is fully established and is supported by a great deal of confirmatory evidence, both from studies of the early changes in human lungs and from knowledge of the general behaviour of cancer-producing agents in mice.

The part played by city life is difficult to assess, because city dwellers on the average smoke more cigarettes than country dwellers. Some authorities like Doll and Hill are sceptical of the importance of smoky city air. Others, like Stocks and Campbell, present a strong case for the view that the total amount of smoke inhaled from any source is what matters. Smoke is important only because of the carcinogens it contains—possibly 3-4 benzpyrene is the important one. Campbell and Stocks believe that if you calculate the total amounts of 3-4 benzpyrene inhaled during a lifetime in a typical smoky city like Liverpool and the amount taken in by smokers of different numbers of cigarettes per day, the conclusions fit quite well with their hypothesis. If this turns out to be the case, the significance of cigarette smoking will simply be that cigarette smoke contains a much higher concentration of carcinogen than even the most murky city air.

The means of prevention are in principle very simple: get rid of smoke from our cities and cigarette smoking from our social habits, and in twenty years deaths from carcinoma of the lung would fall to their irreducible minimum. I believe it is important that the residents of every industrial city should press hard for stringent control of air pollution by any type of incomplete combustion. In democracies any decision about cigarette smoking must be left to the individual. There are, however, straws in the wind. At the last meeting of the British Medical Association in England a rule was adopted against smoking during any of the scientific sessions. This was a gesture made by a majority of British doctors as a means of expressing by personal example their conviction that the gradual elimination of excessive cigarette smoking is one of the major requirements in public health at the present time. In Sweden advertisement of cigarettes and tobacco has been prohibited.

Leuchæmia deaths are also increasing, and as yet we are uncertain as to the cause of the increase. Overdose of X rays or other ionizing radiation is the only environmental factor which has been proved to be capable of inducing leuchæmia. Six months ago there was nothing to suggest that the recent rise in leuchæmia deaths was due to the increasing use of X rays and the like. In the last few months, however, two disquieting reports have appeared. In the first it is shown that the use of diagnostic X-ray examination of the abdomen during pregnancy significantly increases the chance that the child born of that pregnancy will die of leuchæmia or malignant disease during childhood. The second report is that adult patients with one type of leuchæmia have been more frequently exposed to X rays in the past than a comparable group

of persons with another type of leuchæmia. It still remains to be shown what proportion of the increase in leuchæmia is due to these factors. The danger from X rays may be relatively trivial; but it does direct special attention on to the medical problems that are being created by the dawning of an atomic age.

Genetics in Medicine.

In all the conditions I have been mentioning there is an implicit recognition that genetic factors are concerned in one way or another and in varying degrees of intensity. The fact that two of the diseases are lung cancer and leuchæmia is also a reminder of another angle at which genetics impinges on medicine. This is because the only general hypothesis of the nature of cancer which appears to be tenable at the present time is the somatic mutation theory. On this view the various types of malignant disease are the result of a series of mutations occurring, not in the reproductive cells, but in the somatic or body cells of various tissues. There are still serious difficulties in applying this theory to all aspects of cancer, but there is certainly no satisfactory alternative interpretation.

It is inevitable, therefore, that there must be a strong genetic flavour in what I have to say. Probably present conditions do not justify so much concentration on the genetic angle. I can sympathize with the point of view that there is so little we can do about human inheritance that we might well forget about it and concentrate on environmental and psycho-social factors in medicine; but I do not think that attitude will remain tenable for long. The central theme of this address is that genetic aspects of medicine must become progressively more and more important in the years to come.

There are three major reasons for this. The first concerns something we take for granted—the current pattern of family life. In the last two generations in western countries the usual picture has been the family with two to four children, all of whom survive to adult life. From the human point of view that is a highly desirable state of affairs; but from the angle of the biologist interested in long-term evolutionary trends it is something which will lead eventually to a quite intolerable position. The teaching of evolutionary theory in its modern form of population genetics is quite unequivocal. Evolutionary progress has been possible only because of the mutability of genetic mechanisms and the elimination by natural selection of those mutations which diminish the bearer's chance of survival. There is good evidence from breeders of every type of animal that quality can be maintained only by consistent culling of all substandard specimens.

Mutations are always occurring. It has been calculated that on the average each human being may have one mutant gene that was not present in either of his parents. More than 99% of mutations are mildly or seriously deleterious, and the whole history of life has been based on the ability of stringent selection for survival to sort out the tiny fraction of mutations that are beneficial for the species. If we eliminate by medical care and social security most possibilities of natural selection, a steady slow process of genetic deterioration with increasing numbers of cases of overt genetic disease is inevitable.

An interesting example of how this process may become evident is to be seen in the emergence in recent years of a condition of great interest to the pathologist and geneticist—a disease with the clumsy name of agammaglobulinæmia. This in fact means a congenital absence of a substance in the blood which is needed to allow the development of immunity against infection. Such children in the past always died early from acute infection or simple failure to thrive. Today a combination of antibiotics, occasional blood transfusions and unremitting care can keep such children relatively healthy. There is much to suggest that there are other genetic anomalies of the same system with less drastic but generally similar effects.

The second reason for stressing the growing importance of human genetics perhaps represents only a somewhat different way of looking at the first; it is the existence of differential fertility rates. All educationists and psychologists know that intelligence tests show a negative correlation between the intelligence quotient of children and the size of the family from which they come. Children from large families are on the average less intelligent than those from small ones. Why this should be so is still a matter of controversy, and many geneticists hesitate to adopt the common-sense explanation that intelligence has a large genetic determinant, and that under present-day conditions intelligent parents have fewer children than those of lower intelligence. This may have to remain "not proven"; but it seems to me that in the civilizations we know there is little to suggest that health, intelligence and enterprise are commonly correlated with family size. If one believes as I do that such qualities are highly influenced by genetic factors, then we must never forget that the characteristics of our successors will be determined essentially not by the average genetic quality of our present population but by the quality of those producing the majority of surviving children.

The third reason is that the application of various forms of ionizing radiation to human use is increasing at a positively frightening rate and can hardly fail to give rise to a whole new series of medical problems, most of them at the genetic level.

At the present time we are all highly conscious of the impact of nuclear energy on our world; from the biological and medical point of view, that impact is almost wholly evil.

Ionizing radiation has a wide variety of damaging effects on living cells, but there is only one significant effect—a disturbance of pattern in the genetic mechanism of chromosomes and genes. It is a random type of disturbance. A crude but useful analogy might be to think of what would happen to an automatic telephone exchange if a group of inexpert marksmen were firing casual bullets in its direction. The effect of any single hit would be unpredictable, but almost all hits would be damaging. Only by a fantastically lucky chance can random interference with an elaborate mechanism improve its functioning. In one very important point the analogy breaks down. If the damage produced in cells by radiation is not too severe, the descendants of those cells carry the same type of damage to their genetic mechanism. It is inheritable damage.

Any cell can be damaged by penetrating radiation—the likelihood of damage being dependent on the type and amount of radiation received during the lifetime of the cell. Serious damage which prevents any subsequent multiplication of a cell has no medical significance. Lesser degrees of damage to germ cells may also be of relatively minor human importance, if the damage is such that when fertilization occurs and development begins the offspring is so distorted that it does not survive to be born. It is when the damage is very slight, physically speaking, so that the eventual progeny is faulty in just one facet, that we find what we call genetic disease. Hæmophilia—a disease in which repeated bleeding results from a weakness in the blood-clotting mechanism—is the best-known human example, but there are multitudes of others. I do not want to discuss any detail whatever of genetics; but it is necessary to mention that most defects induced in germ cells by irradiation will give rise to recessive effects which will become evident only when the ovum is fertilized by a spermatozoon carrying the same recessive gene. This is the basis for the well-known warning that the effects of the atom bombs dropped on Japan may not all be evident till many generations have elapsed. One other point that must be stressed is that the results of radiation are cumulative. There is just as much likelihood of harm if one unit of radiation is received each day for a year as if 365 units are received in a fraction of a second.

Not only the germ cells are subject to mutation. Any living cell will be similarly modified by appropriate exposure to radiation. However, any effect will be dependent on how many descendants it has. Mutations sometimes occur in the course of development, and involve only that proportion of the cells in the grown organism which descend from the cell in which the mutation occurred. These are called somatic mutations and are usually recognized when the mutation results in the appearance of a colour difference over portion of the skin—a so-called

mosaic. But somatic mutation can occur in any cell at any time in the life of an organism. Always the same rule holds—somatic mutation is of no significance unless the cell concerned has many descendants. It follows that when a mutation occurs in an organism that has reached full development it is significant only if it is of such a character that cells carrying the mutation produce more descendants than similar but unmutated cells.

The most likely interpretation of human cancer is that it is a result of a series of somatic mutations, each of which removes or diminishes one of the controls which keep the cells of the body in their form and order. I am not going to attempt to give the evidence for this interpretation; but I think you can see the grim logic of the biological situation in which random mutations are always occurring, either spontaneously or under the stimulus of radiation or mutagenic chemicals. Cells whose descendants grow more rapidly flourish and may undergo new mutations which again are successful only if they lead further along the road to uncontrolled growth, which is cancer. There are virtually only two current interpretations of cancer, the somatic mutation theory, which I have described, and the virus theory, which ascribes cancer to infection with very low-grade viruses. I can find nothing in the recorded behaviour of natural or experimental cancer which is incompatible with the first hypothesis, but a great deal which makes the virus theory untenable, in my view at least.

On this view ionizing radiation should be a potent cause of cancer, and it is. The early radiologists suffered much from cancer of the skin; and now, with better protection, but with much more powerful machines, they show a significantly increased incidence of leuchæmia. X rays have been used diagnostically and therapeutically for sixty years, and more is known about their effect than about that of any other type of penetrating radiation. There have been two unfortunate results of unwise therapeutic use—the production of leuchæmia in a small but significant proportion of patients treated for a disease of the spine (ankylosing spondylitis), and of cancer of the thyroid in children given X radiation for supposed enlargement of the thymus. Earlier I mentioned the very recent finding that the diagnostic use of X rays in pregnancy could increase the likelihood of leuchæmia in the child subsequently born. Human experience with radioactive substances has been more limited, but the lethal potentialities are even clearer. Long ago, when luminous watch dials were painted with a composition containing minute amounts of radium by girls who tipped their brushes between their lips, there was a tragic sequel of many cases of malignant disease of bone amongst these workers. Of the modern artificial radioactive elements, radio-strontium resembles radium in its capacity to lodge in bone and provoke sarcomatous growth. Leuchæmia has been the only chronic effect so far recognized as due to irradiation from the Hiroshima and Nagasaki bombs.

Protection Against Ionizing Radiation.

In June last year the Medical Research Council of Great Britain and the National Academy of Sciences of the United States of America both published authoritative reports on the dangers of ionizing radiation. Both cover very much the same ground, and both come to virtually identical conclusions, which I can try to summarize under four headings as follows:

1. All ionizing radiation, whether from X rays, radioactive materials or any other source, is harmful, and avoidable exposure should be kept to a minimum.

2. At the present time the most important source of ionizing radiation is the medical use of X rays—test atomic explosions are of much less significance.

3. If atomic weapons are not used in major war, the effect of atomic radiation in the foreseeable future is not likely to have observable medical results on people generally.

4. Increasingly difficult problems will arise in connexion with the safe disposal of radioactive wastes from the industrial use of atomic energy.

Interest in the medical problems of atomic radiation has been responsible for a critical reexamination of the light-hearted use of X rays in medicine and industry. As far as an outsider can judge, the risk attaching to brief diagnostic exposures not involving the reproductive organs is negligible, although the American committee recommends that in the interests of improving knowledge any X-ray exposures should be recorded in all patients' medical histories. Any type of X-ray examination involving the pelvic organs in children or adults within the reproductive period of life, and particularly during pregnancy, should be considered very critically and carried out only if it is absolutely essential for the proper treatment of the patient. Therapeutic use of X rays should be limited to the treatment of established cancer.

It should be possible to reduce the hazards of medical uses of radiation to negligible proportions, and there is every reason to believe that in the factories concerned with the production of nuclear weapons in America and Britain, strict and effective precautions against more than tolerable health hazards are enforced. But the use of atomic energy has only begun. We can hope with some reason that we shall escape major atomic wars; but unless history is meaningless, a rapid and continuing increase in the use of nuclear reactors in industry is inevitable. With a rapidly increasing world population demanding a greatly raised living standard, it may soon become the only way to provide the energy required. Those interested in the long-term prospects of civilization know very well that if the whole of the world adopted an American standard of living our reserves of oil and coal—our fossil fuels—might last less than a century.

Accidents and human carelessness are unavoidable in industry. An illuminating hint of the shape of things to come can be drawn from two Australian episodes, in which highly lethal capsules containing the radioisotope Cobalt 60 were left lying about, to be picked up by a workman who suffered from a serious burn, and by a child who fortunately was allowed to play with the capsule for only a few minutes. Increasing use of nuclear energy cannot fail to be associated with a steadily increasing amount of short-term and long-term biological damage.

But we must maintain a sense of proportion. I have already said that authoritative present-day opinion is that at the genetic level the effect will be undetectable by any but refined statistical methods for perhaps a century or more, even if a considerable absolute amount of genetic damage is being done. The reason, of course, is that every individual carries on an average about eight harmful recessive genes, the accumulation of many centuries of mutation. Muller calculates that it would take a major atomic war to produce an effect that would be easily visible within a generation. Similarly, the immediate effect on individuals of an increased exposure to radiation would, on an overall scale, be relatively light. It is said that radiologists on the average die five years earlier than comparable professional colleagues, and that their likelihood of contracting and dying from leuchæmia is several times as high. That, *plus* a moderate increase of other forms of cancer, probably in bone or other unusual sites, is probably the sort of change we could expect. On the short-term view it is punishment that the community can easily absorb. The toll of death and ill-health from penetrating radiation, apart from major war, is bound to be much less than we accept from road accidents today. The reason for putting it in a different category is the cumulative character of genetic damage. With modern medicine to cushion the effects of natural selection, every deleterious mutation sets going a process like a slowly spreading disease, progressively weakening all generations to come.

Perhaps history will decide that the most important result of the discovery of atomic power is not its military or industrial importance, but the attention it has drawn to the importance of genetic processes for human affairs. It is certain that we shall see an increasing use of nuclear power as long as civilization survives and raw materials are available. As scientists and medical men, we must be adamant that there shall be no reduction in the present

high standards of safety measures, and that special precautions be taken against every conceivable catastrophe that may involve a nuclear reactor. I do not think, however, that increasing exposure to radiation is genetically nearly as important as the two related processes that I bracketed with it—the elimination of selective survival as a result of medical care, and the influence of differential fertility. If we are ever to devise measures to counter the medical and social effects of genetic deterioration, it will be immaterial whether the mutations responsible were produced by irradiation today or by natural causes any time in the past thousand years. I believe we can already see in outline what the necessary measures will be. Both the official British and American reports agreed that at the present time the major need was more knowledge of human genetics. We need to learn a great deal more about the laws of human inheritance, and particularly to find ways by which the existence of harmful recessives in a person's genetic make-up can be recognized. Closely related to this is the elaboration of ways by which the somatic mutations which are steps along the road to cancer can be recognized. For both purposes a great deal more study of cellular behaviour in experimental animals and tissue cultures will be needed to improve the background against which the human problems must be studied; but I should like to stress that the human problems must be studied very much as human problems—laboratory work on animals can only provide clues. This holds at both the levels of genetic change that we have been considering—somatic mutation in relation to cancer, mutation in the reproductive cells in relation to genetic deterioration.

Cancer.

In regard to cancer, the immediate need is to sort out the various environmental stimuli to somatic mutation, particularly those other than ionizing radiation, and as far as practicable protect sensitive tissues from them. Fortunately the reproductive cells are well protected from anything but penetrating radiation. But other mutagens and carcinogens can reach skin, air passages, intestinal tract and other parts of the body in direct contact with the environment. I have mentioned what is known of lung cancer and how this knowledge could be used as a means of preventing 90% of it. There are hints that some other types of cancer may be related to controllable environmental factors, and perhaps new opportunities for the prevention of cancer may emerge in the future. Despite great modern advances in cancer treatment, the overall death rate from cancer has shown little change in recent years. As in every other phase of medicine, prevention is better than cure. At the present time the two most needed activities are the development of a climate of opinion that will dissuade young people from starting to smoke cigarettes, and careful control of all exposure to X rays and other forms of ionizing radiation.

Genetic Disease.

With regard to genetic disease proper, the important task is to find ways of recognizing what is happening in human inheritance. The most immediately promising approach is to make increasing use of the opportunities Nature has provided in identical twins. I have been very interested in this approach, and for the last two years we have had a twin study in progress in Melbourne. Special attention has been paid to the problems of identical twins whose medical histories are not concordant, as one of the best ways of analysing the respective parts of inheritance and environment in the production of disease. I do not anticipate any great contribution from a single unit; but I believe that it is important to have twin study as part of the set-up of every medical school. Only by the accumulation of necessarily unconnected pieces of information (for every pair of identical twins is in one way or another unique) shall we obtain the information needed about the genetic contribution to disease. The more work that is going on, the more likely are the overall results to be significant. The other reason for such work is its extreme educational value. More than anything we need the balanced approach of the good doctor, who can by a combination of knowledge and subconscious wisdom assess the relative importance of the environmental, genetic and psychosocial factors that have produced the sick person in front of him, and always on the basis of incomplete knowledge make the wise decision that will be best for his patient. I would hope that association with twin studies in which, as in no other way, we can sort out something of the relative importance of nature and nurture, will provide the best possible opportunity for such a broad education in medicine.

Human genetics may seem a thoroughly academic subject at the present time, and perhaps it will always remain so. On the other hand, it holds the only answer to the progressive genetic deterioration that at the moment seems to be inescapable. Differential fertility is probably the most potent factor in producing this deterioration; but it is also the key to its eventual reversal.

If in a hundred years' time we have the necessary knowledge, it should not be impossible by appropriate incentives linked to new social conventions and taboos to ensure that those carrying dangerous recessive characters had fewer children than those with sounder inheritance. That admittedly is impossible now; but social conventions have changed enormously in our lifetime, and they will change even more in the next hundred years. If we are deliberately accepting a situation which will steadily cause deterioration in the genetic character of the species, if we insist on the family of two or three children who, thanks to modern preventive medicine, will all survive to adult life, then the only possible solution is to provide a socially acceptable substitute for Nature's ruthless elimination of the unfit. Many things may arise to make such a solution impossible; but I would still believe that to find the knowledge which may make it eventually realizable is the most important field of research that confronts us in medicine.

EARLY BREAST CANCER AND ITS MANAGEMENT.

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THE results of treatment of breast cancer leave much to be desired, and are to a large extent unpredictable. Whilst it is appreciated that some other, perhaps chemotherapeutic, line of approach may be the ultimate solution to the problem, it is still necessary to aim at the earliest possible recognition of the disease, and to ensure that maximum use is made of the knowledge and techniques at our disposal.

In recent years considerable advances have been made in palliative measures of treating advanced breast cancer. However, it is in the early case, the cancer which we hope is curable, that there is lack of agreement as to what is the best form of management.

Published results of treatment are notoriously difficult to evaluate, in so far as they are based on different standards of case selection, and of assessing survival, cure *et cetera*.

Tables I and II are a compilation of what are considered to be the more significant of the published results. It is evident that the ten-year survival rate, when all patients treated are considered, is 25% or less (Table I) and that the best ten-year survival figure for "operable" patients is 49% (Table II). This latter figure, obtained by one surgeon alone, is appreciably superior to the results obtained by other groups of workers using different methods of treatment.

Statistics on the results of treatment of breast cancer, in its various stages, are based largely on a clinical assessment of the extent of spread prior to the commencement of treatment. Whilst it is agreed that the only means at our disposal for determining blood-borne spread is radiological, it is the view of the writer that insufficient importance has been attached to investigations which have been carried out demonstrating that lymphatic spread is frequently much further advanced than can be determined

clinically. These findings will now be reviewed, and in the light of this review a method will be suggested for the management of the "early" case, which, in the writer's view, is more rational, and at the same time provides a sounder method for comparing the results of different forms of treatment.

The term "early" is used throughout in the same sense as "operable", and corresponds to Stages I and II of the Manchester classification. That is, "early" cancer is regarded as the case in which no distant metastases are detectable, the opposite breast is not affected, there are no palpable glands in the supraclavicular areas, and there is minimal skin involvement over the tumour and minimal evidence of fixation to underlying muscle. Glands may be palpable in the axilla of the same side only, but they must not be adherent.

TABLE I.

Ten-Year Survival Rate, All Patients Treated.

Author.	Number of Cases.	Survivals.	Percentage Survivals.
McWhirter (1955) (Edinburgh)	480	122	25
Smithers, Rigby-Jones, Galton and Payne (1952) (Royal Cancer Hospital, London)	429	91	21
Windeyer (1949) (Middlesex Hospital)	282	62	21·9

The Importance of the Lymphatic Field of the Breast.

The lymph channels draining the breast pass to the axillary and internal mammary (or parasternal) groups of glands. The former can be examined clinically, the latter cannot. Metastases in the axillary glands pass next to the supraclavicular group, and when these are palpably enlarged, the cancer is, of course, no longer classifiable as early.

Conclusions drawn from palpation of the axillary glands may be quite incorrect. These glands are often palpable in normal individuals, especially in the presence of hormonal mastopathy, and conversely, they are frequently not palpable when metastases are present. Riddell (1948) found that in 69% of cases in which axillary glands were palpable, no microscopic invasion of the glands was demonstrable. In 50% of the cases in which glands were not palpable, microscopically evident metastases were present. Berven (1949) found no metastases in palpable glands in 30% of his cases, and 15% involvement in cases in which there were no palpable glands. In addition, in one-third of this 15% there was microscopic evidence of spread beyond the capsule of lymph glands.

Likewise there may be unsuspected metastases in the supraclavicular group of glands. Andreassen, Dahl-Iversen and Sørensen (1954), in a radical operation extended to include the supraclavicular glands, found, in a series of 98 cases, unsuspected metastases in these glands in 33% of those in which the axillary glands were involved.

Finally, there is frequently involvement of the parasternal glands, irrespective of whether these are the first "port of call" of the cancer cells, or whether the involvement occurs as a retrograde spread after blockage of other lymph channels. Handley and Thackray (1954) examined biopsies from the parasternal chain in the second and third intercostal spaces in 150 "operable" cases, and found an incidence of 33% involvement of the biopsy material. The incidence was considerably higher when the primary tumour was in the medial half of the breast, but also occurred with lateral-half tumours. Similar results were obtained by Andreassen, Dahl-Iversen and Sørensen (1954) when in a second series they extended the radical operation to include the parasternal glands only. In a third series the same authors excised both the supraclavicular and the parasternal glands with radical mastectomy. When metastases were found in the axillary glands in this series, they were also present in the supraclavicular glands in 9%, and in the parasternal glands in 53%.

It must therefore be concluded that the premises on which radical mastectomy is based are frequently unsound, and in many instances this operation is quite unjustified, as the lymphatic spread of cancer cells has already extended beyond the scope of the operation.

Assessment of the Early Case.

If it is assumed that distant metastases have been, as far as possible, excluded, and that the primary growth is early, how is the extent of spread to be determined? How is a rational form of treatment to be planned?

It is logical first to determine the presence or absence of metastatic deposits in the supraclavicular and parasternal glands. Stibbe (1918) states that macroscopically detectable glands along the internal mammary vessels occupy the first, second, third and sixth intercostal spaces. It is reasonable to assume that if metastases are present in this chain, they will most likely be present in the glands of the second and third intercostal spaces. In fact, Handley (1948) stated that his method of treatment of operable breast cancer was determined by preliminary biopsy of these glands. Urban (1955) has shown that involvement of glands in the first, fourth and fifth intercostal spaces is unlikely without simultaneous involvement of those in the second and third intercostal spaces.

TABLE II.

Ten-Year Survival: "Operable" Cases.

Author.	Number of Cases.	Number of Survivals.	Percentage of Survivals.	Method of Treatment.
Gordon - Taylor (1948) (personal series).	317	155	49	Radical mastectomy alone.
McWhirter (1955) (Edinburgh).	254	99	39	Simple mastectomy followed by irradiation.
Windeyer (1949) (Middlesex Hospital).	122	46	37·7	Radical mastectomy with or without post - operative irradiation.
Lewison, Trimble, Griffith (1953) (Johns Hopkins Hospital).[1]	220	64	29·1	Radical mastectomy alone or with radiotherapy (simple mastectomy in 14 cases).

[1] This series was compiled in the period 1935 to 1940, and at that time the efficiency of radiotherapy was not comparable with present-day standards.

It should therefore be reasonable to perform initially a biopsy-excision of the medial group of supraclavicular glands, and of the parasternal glands in the second and third intercostal spaces. This could be combined with biopsy of the breast tumour. After microscopic examination, it should be possible to be reasonably confident of the extent of lymphatic spread of the malignant process. (It is assumed that blood-borne spread is a comparatively late phenomenon.) The further management depends upon interpretation of such controversial issues as the following: how far it is reasonable to extend the "radicalness" of mastectomy; the danger of dissemination of cancer cells during their removal; the efficacy of irradiation therapy in destroying cancer cells; the efficiency of available radiotherapeutic services; the expectation of life from natural processes; and so on.

What criticisms can be levelled at this suggested procedure? It may be argued that if cancer cells are present in the glands, they will be disseminated by the procedure, or that metastases may be missed in the lower intercostal spaces along the internal mammary vessels, or behind the clavicle. The former is a possibility; but the chances of its significantly affecting the end results of treatment are small. The latter argument has been discussed in the light of Urban's findings (1955).

The procedure is a simple surgical exercise provided that the peculiarities of the local anatomy are borne in mind, and it is thought that the advantages to be gained from its use outweigh the possible disadvantages.

The case in which the gland biopsy suggested gives positive findings, and the case in which it gives negative findings, must be considered separately.

Procedure Suggested when Metastases are Present in Supraclavicular and/or Parasternal Glands.

It is obvious that radical mastectomy is quite out of the question when metastases are present in supraclavicular and/or parasternal glands.

"Super-radical" operations have been advocated and practised by Wangensteen (1952) and by Urban (1952, 1955). Such procedures, which may entail mobilization of the clavicle to remove supraclavicular glands and deep cervical glands as high as the thyroid cartilage, and splitting of the sternum to remove parasternal and mediastinal glands, may be attended by an operative mortality rate much higher than is the case with the radical operation, even when they are performed by highly skilled surgeons with every possible assistance. (In 47 cases Wangensteen had an operative mortality of 12·7%.) These are heroic procedures, and if undertaken in less favourable circumstances must indeed carry prohibitive mortality and morbidity rates. While it is conceivable that it may be possible to remove glands *en bloc* without dissemination of contained cancer cells, in some instances dissemination may not be preventible, and the procedure will then be useless.

The best palliative procedure in cases in which metastases are demonstrated in supraclavicular and/or parasternal glands would therefore appear to be simple mastectomy followed by irradiation as soon as possible after the incision has healed.

Management when the Supraclavicular and Parasternal Glands are Free of Metastases.

It is clear that it is not possible to be certain, on clinical findings alone, whether metastases are present in the axillary glands, unless, of course, they are grossly enlarged and adherent.

The procedures available are radical mastectomy, radical mastectomy with supportive radiotherapy, or simple mastectomy with radiotherapy. Here again the issues are highly controversial, and it is well-nigh impossible, from results quoted by various authors, to judge which method is likely to be attended by the best results. It is therefore necessary at this stage to consider certain principles involved concerning the methods at our disposal.

Radical Mastectomy.

If we believe that it is possible to perform radical mastectomy without dissemination of cancer cells present in the axillary glands, then it is, in this case, the method of choice. Argument for its use as the sole method of treatment is certainly stronger in those cases in which axillary glands are not palpable, and conversely less when these glands are grossly enlarged, and particularly when some loss of mobility is demonstrable. Perfection of technique is a prerequisite for survival figures such as those of Gordon-Taylor (see Table II), and it is noteworthy that his figures are unequalled by any group of surgeons.

Apart from the possibility of dissemination, the disadvantages of the radical operation (as compared with simple mastectomy) are an operative mortality rate of 1%, and the lymphœdema and limitation of shoulder movement which unfortunately are still found in a few cases, especially if sepsis has occurred, or if radiotherapy has been given. The influence which the radical operation has on the use of irradiation is discussed below.

Irradiation Therapy.

Great advances have been made in the field of radiotherapy in recent years. However, the question of whether it will ever be possible, with irradiation in practicable dosage, to destroy breast cancer cells completely, is unpredictable. Certainly present-day methods are still inefficient in this respect.

Haagenson (1949) examined microscopically specimens from 38 cases in which radical mastectomy had been performed after irradiation. In all cases there were viable cancer cells surrounded by dense fibrous tissue.

Adair (1949) holds that X rays cannot be relied upon to destroy axillary metastases, stating that a cancericidal dose (5000*r* to 6000*r*) cannot be applied without great damage to the structures of the chest wall. Similar views are given by Cade (1949) and by Windeyer (1949).

McWhirter (1954) admits that it is difficult to kill cancer cells, but suggests that their chromosome structure may well be so irrevocably damaged that they lose their true malignant properties. He expresses the view that it is probably easier to destroy cancer cells in the glands than in the primary tumour; also that the optimum dosage at any one point in the field irradiated is not less than 3750*r* (with a maximum of 4250*r*) and that treatment should be given over a period of three weeks.

Those who advocate the radical operation alone in the early case stress the disadvantages of radiotherapy—in particular impaired healing of the wound, irradiation sickness, pulmonary fibrosis, lymphœdema, and the theoretical possibility of diminished resistance of the host to the invasion of cancer cells.

A reasonable argument put forward by the opponents of the radical operation in the "doubtfully operable" case is that the operation delays the application of irradiation, and that poor healing, thin skin flaps, and the use of split-skin grafts render it difficult to give adequate dosage.

What procedure, then, may be adopted in the early case, in which the supraclavicular and parasternal gland biopsy findings are negative?

If glands are not palpable in the axilla, radical mastectomy alone is advocated by Cade (1949), by Gordon-Taylor (1948) and by Adair (1949).

If glands are palpable, and even fixed, Cade (1949) and Windeyer (1949) both have advocated pre-operative irradiation and radical mastectomy. Adair (1949) claimed that the results from this regime were not good because of the delay, which he said might be up to six months, before operation could be undertaken. He therefore advocated post-operative X-ray therapy. Berven (1949) advocated pre-operative and post-operative irradiation therapy, claiming better results in his hands by this method than with post-operative irradiation alone.

McWhirter (1948, 1955) claimed that simple mastectomy followed by irradiation gave results as good as, if not better than, other methods. He maintained that if the axillary glands were not involved they were best left alone. If they are involved, his figures show that his method produces, in his hands, better results than radical mastectomy with or without post-operative irradiation, and he deduced that the radical operation caused dissemination of cancer cells present in the axillary glands. Other observers would have it that McWhirter's figures do not take cognizance of advances made in irradiation technique during the periods of comparison. However, his figures for ten-year survival do suggest that it is likely that cancer cells in lymphatic glands can definitely be suppressed for long periods by efficient irradiation.

Conclusions.

It is suggested that the management of "early" breast cancer should be as follows:

1. The initial investigation should include both breasts and the axillary and supraclavicular glands of both sides, abdominal and vaginal examinations, and X-ray examination of lungs, skull, spine and pelvis. It is considered important that palpation of the tumour should be gentle so as to minimize the risk of dissemination.

2. If it is concluded that the tumour is "early", then biopsy-excision of the supraclavicular glands in the

claviculo-sterno-mastoid angle, and of the gland-bearing tissue around the internal mammary vessels in the second and third intercostal spaces, should be carried out, supplemented (in most cases) by biopsy of the primary tumour. The presence or absence of metastases in these specimens should be determined by examination of frozen sections, or of paraffin sections if the former is not available or is inconclusive.

3. If metastases are present in one or both glandular groups, the best procedure is simple mastectomy followed by irradiation along the lines advocated by McWhirter (1954) as soon as the wound has healed. It is very doubtful whether super-radical operations are justifiable, although there may be justification for Urban's procedure of radical mastectomy with dissection *en bloc* of the parasternal glands, in medial-half tumours, provided that there are no metastases in the supraclavicular glands as determined by biopsy.

4. If examination of both groups of glands gives negative results, a carefully performed radical operation without irradiation is probably the best procedure, except that if metastases are demonstrated microscopically in the removed axillary glands, post-operative irradiation may well be given in addition. If the axillary glands are palpable, it may be better to precede radical mastectomy by irradiation, or to give pre-operative and post-operative irradiation. (The superiority of these modifications has yet to be demonstrated.)

5. If there is loss of mobility of the axillary glands, it would appear, from Table II, that McWhirter's method may be the best procedure (provided that radio-therapeutic services of comparable efficiency are available). Alternatively, radical mastectomy preceded by radiotherapy is probably the method of choice. (It is noteworthy here that McWhirter states that it is difficult to give an adequate dose of irradiation to the axillary glands in the presence of excessive fat, and in these instances he advocates the radical operation instead of simple mastectomy.)

Windeyer (1949) stated that it should be possible to carry out radical mastectomy without too much inconvenience from hyperæmia or fibrosis "three to four months after irradiation". No doubt most surgeons have considerable concern about the healing qualities of the skin flaps under these conditions, and would argue that too much time is lost, and that it is difficult to give further irradiation to metastases in the chest wall should they appear at a later date.

It is obviously highly desirable that there should be close cooperation between surgeon, pathologist and radiotherapist in all cases.

Finally, it is considered that adoption of this plan may well produce better results, and will place the "staging" of breast cancer on a sounder footing of microscopic anatomy (as opposed to clinical findings); this would render both intelligible and truly comparable the statistics of the long-term follow-up of treatment by various methods and in different centres. There is no doubt that it would, at the same time, eliminate the performance of many needless radical operations.

Summary.

1. Significant figures concerning the results of treatment of breast cancer are tabulated.

2. Evidence is reviewed which indicates that spread of breast cancer along lymphatic pathways is frequently more extensive than can be determined by clinical examination, and that microscopic examination of lymph glands is a more accurate method.

3. It is suggested that an initial step in deciding the management of an "early" breast cancer should be biopsy of supraclavicular and parasternal glands.

4. The various methods of treatment in use at the present time are discussed.

5. A plan is presented for the management of the early case, based on the biopsy findings of supraclavicular and parasternal glands.

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PROLONGED SURVIVAL OF NEISSERIA GONORRHŒÆ: AN AID TO THE DIAGNOSIS OF GONORRHŒA.

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THE diagnosis of acute gonorrhœa can usually be accomplished by microscopic examination of urethral or cervical exudates; in chronic cases, however, microscopic diagnosis is always tedious and sometimes impossible, even to the experienced eye. In both instances there can be no doubt that confirmation of the diagnosis by culture of the organism from the patient would be of great value. Unfortunately, many attempts to cultivate *Neisseria gonorrhœæ* from patients have produced inconsistent results, owing mainly to the delicate nature of the organism; its death occurs rapidly outside the body, and until quite recently successful culture was possible only by inoculation of material direct from the patient to the culture medium. This procedure is impractical for the general practitioner, and the tendency has been to rely solely upon microscopic diagnosis, except in clinics equipped for bacteriological investigation. Alexander (1952) has shown, moreover, that particularly in the female patient, direct culture is not always successful.

If routine culture examination for *N. gonorrhœæ* is to be undertaken, it is essential that some mode of transport of specimens should be used which is capable of maintaining the viability of the organisms at least for some hours. Many methods designed to this end have been reported in the last decade; most have embodied the use of artificial media rich in nutrients in order to encourage the growth of the organisms. Unhappily, rapid overgrowth of the pathogen by less exacting commensal organisms very often occurred, and even the use of theoretically selective inhibitors did not satisfactorily solve this problem. Other methods, such as freezing the specimens or, alternatively, maintaining them at 37° C., were of little value. These methods were unsuccessful mainly because the reason for the rapid death of the organisms was not realized. However, Stuart, arguing on the grounds that death was primarily due to oxidation and drying of the organism, devised a simple transport medium which he used successfully for the delayed culture of gonococci and meningococci (Moffett, Young and Stuart, 1948). The medium contained no nutrients, so that any growth of either the pathogen or commensal organisms was prevented; its efficiency was due mainly to the enclosure of the organisms in a moist and anaerobic situation, forestalling both oxidation or drying. Alexander (1952) and the workers in England and France have since confirmed the usefulness of the medium particularly for the diagnosis of gonorrhœa in the female. In 1954 Stuart and co-workers amplified the previous results and compared the use of the method under British and Canadian conditions.

Until the present time no really successful attempts to diagnose gonorrhœa by culture have been reported in Australia; most clinics and laboratories tend to rely solely on clinical findings and microscopic examination for the diagnosis of gonorrhœa. In view of this, we thought it worth while to investigate the use of the Stuart swab kit under Australian conditions, with the hope that a cultural diagnostic service might be offered generally to medical practitioners.

Materials and Methods.

The Stuart Swab Kit.

The swab kit contains a charcoal-impregnated swab and a quarter-ounce screw-capped bottle filled to capacity with the Stuart medium (*vide* Stuart *et alii*, 1954). This medium is a semi-solid agar to which has been added 0·1% thioglycollic acid to act as a reducing substance. It is buffered in calcium chloride and sodium glycerophosphate and contains a trace of methylene blue acting as a "redox" indicator; the medium, to be effective, should show no trace of blue coloration. After the clinical material has been taken on the charcoal swab, it should be thrust deeply into the medium, and the shaft should be broken or cut off with sterile scissors and the cap of the bottle screwed firmly down. The kit may be kept at room temperature until required for culture.

Collection of Swabs.

Swabs should not be taken for culture from patients of either sex less than three hours after urination; this precaution has been observed as carefully as possible throughout these investigations.

In the male, the glans and meatus should be carefully cleaned with dry sterile cotton-wool swabs and sterile distilled water. The charcoal swab is then inserted into the meatus to collect fresh urethral exudate. In uncircumcized patients the procedure is carried out with the prepuce retracted. If necessary, rectal massage of the prostate is performed with the swab in the urethra.

In the female both urethral and cervical swabs are taken for culture. Gentle urethral massage *per vaginam* should precede the insertion of the charcoal swab into the urethra. For cervical swabs, the lithotomy position, a suitable bivalve speculum and good illumination are essential. The charcoal swab is inserted after the cervix has been cleansed with dry sterile cotton-wool mounted in a sponge holder. The swab should be left *in situ* for at least thirty seconds and moved about a few times. If the clinical signs indicate it, Bartholin's glands may be massaged after careful cleansing of the area surrounding the duct openings, and swabs inoculated with any exudate produced.

In both sexes, material for microscopic examination is taken after that obtained for culture. Smears are made with a swab or conventional platinum loop; the former method has been found preferable. Thin smears are essential and should be air dried; the smear is fixed by heat just prior to staining by Gram's method. If confirmation is required, a separate smear is stained by pyronin-malachite green.

TABLE I.

Cases of Gonorrhœa Diagnosed from October, 1954, to October, 1955.

Number of Patients	"Smear-Positive, Culture-Positive."	"Smear-Positive, Culture-Negative."	"Smear-Negative, Culture-Positive."	Total Number of Positive Findings.	Percentage of Positive Findings.
Males, 1159	280 (85·5%)[1]	34 (10·5%)[1]	13 (4·0%)[1]	327	28
Females, 275	28 (59·5%)[1]	2 (4·5%)[1]	17 (36·0%)[1]	47	17

[1] Figures in parentheses indicate percentage of positive findings.

Cultural Diagnosis.

The swab kits received in the laboratory were usually subcultured within twenty-four hours of their collection; on occasion the culture was delayed for forty-eight to seventy-two hours. The charcoal-impregnated swabs are removed from the Stuart medium with sterile forceps and inoculated on chocolate agar plates; they are then incubated for thirty-six to forty hours at 37° C. in an atmosphere of 10% carbon dioxide.

N. gonorrhœæ was identified by colonial and microscopic morphological findings, together with the oxidase reaction, a 1% solution of tetra-methyl-p-phenylene diamine hydrochloride being used as the reagent. The identification was confirmed by observing the biochemical reactions of the organism in glucose, maltose and sucrose serum media; as yet no organisms identified previously as *N. gonorrhœæ* have failed to show the typical biochemical reactions.

Microscopic Diagnosis.

Smears of urethral and cervical exudates stained by Gram's method were examined exhaustively. *N. gonorrhœæ* can be identified as typical Gram-negative diplococci and should be seen intracellularly. In cases of doubt a smear stained by pyronin-malachite green is useful; this stain throws into contrast scanty gonococci which may not be convincingly recognizable in Gram-stained smears. It is essential that a painstaking and systematic search of smears should be undertaken in all cases before a diagnosis of gonorrhœa is rejected.

Results.

Table I summarizes the results of 1434 examinations for gonorrhœa on all patients attending the Government Clinic from October, 1954, to October, 1955; 374 were positive.

Males.

Of the positive findings, 96% were detected by microscopic examination of urethral or prostatic smears; 89·5% of the positive results were detected by culture. It is apparent that when the microscopic and cultural diagnoses differ, the "slide-positive, culture-negative" disparities preponderate; the possible reasons for this will be discussed later.

Females.

Only 64% of all cases of gonococcal infection in the female were diagnosed microscopically. On the other hand, approximately 96% of the cases were diagnosed culturally, and of these 36% were not recognized by microscopic examination. Thus there is a striking superiority of the

culture technique which must be attributed directly to the Stuart swab. Some of the women examined at the clinic were requested to attend because their partners were infected; in some cases, when the examination was carried out well inside the seventy-two hour minimum incubation period, positive cultures were obtained, while long search on slides failed to detect *N. gonorrhœæ*.

Discussion.

Over twelve months' experience of the Stuart swab technique for the diagnosis and exclusion of gonorrhœa, undertaken jointly by the Government Venereal Diseases Clinic and the Public Health Laboratory, has produced most satisfying results. The method has proved invaluable as a test for cure after antibiotic therapy in both male and female patients. Moreover, it has served as a useful confirmatory test for the diagnosis of gonorrhœa in the male; if a sufficiently painstaking search of smears is made by an experienced observer, practically all cases will be diagnosed microscopically. The culture from male patients is not quite as successful; as our experience of the method increases, the reasons for the failure to obtain cultures in some 10% of the cases have become more apparent. In some cases the reason for failure has been obvious: swabs have been contaminated with *Proteus vulgaris*, which completely covers the inoculated plates, thus making it impossible to detect colonies of *N. gonorrhœæ*. In several of the earlier cases failure to cultivate the organism may be attributed to faulty technique in taking the swab. Prior to the introduction of the Stuart swab technique, attendants at the clinic had been trained to obtain a droplet of pus without, if possible, touching the mucous membrane. It is now realized that, although this method is suitable for direct smear preparation, it is unsatisfactory for culture. A streak of pus lying between the meatal lips for even a few minutes absorbs a certain amount of oxygen. If this pus is not removed before insertion of the charcoal swab, it will provide the bulk of the inoculum; sufficient oxygen will be present to seriously impair the chances of survival of the organisms in the Stuart medium.

Probably the most important reason for the failure to cultivate the organism from some male patients is the use of "light" therapy before the patient reaches the clinic. A considerable number of male patients are seamen who develop a discharge at sea, in a ship which either does not carry a surgeon, or in which the surgeon is not particularly skilled in the treatment of urethral discharges. In both circumstances the patient frequently is treated with inadequate doses of a sulphonamide drug. Other patients may take a few "tablets" left over from their own previous treatment or supplied by a friend. The end result is that when the patient attends the clinic, though unquestioned gonococci can be recognized in a direct smear, the organisms are probably either moribund or dead.

It is with the female patient that the Stuart swab technique has its greatest value. It has proved to be quite outstanding, in that it has detected some 30% more cases (or carriers) than has direct microscopic examination. Very often cervical smears may be crowded with organisms, cells and debris, and the chances of recognizing gonococci in such instances are slight. Moreover, it is apparent that some women may be asymptomatic carriers of the organism; in these cases the woman acts merely as a passive vector of the organism without developing gonorrhœal symptoms. Culture has proved to be the only means of detecting the presence of the organism in such women.

Summary.

1. The results of a trial of over twelve months in which the Stuart swab technique was used for the culture of *N. gonorrhœæ* are presented.

2. The method has yielded most satisfying results for both the diagnosis and the exclusion of gonorrhœa in male and female patients.

3. In male patients it serves as a satisfactory confirmation of a diagnosis obtained by smear examination. In the female, however, the results indicate that the culture technique is far more efficient in detecting cases and asymptomatic carriers.

4. The technique of taking the swab from both male and female patients is described, and certain precautions to be observed are indicated.

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THE MORTALITY OF CHILDHOOD IN AUSTRALIA: PART II. THE SCHOOL AGES.

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THE present paper concludes the study of mortality in childhood in Australia by considering the mortality of the children of school age, five to fourteen years. The mortality of infancy and of early childhood has already been considered (Lancaster, 1956*a*, 1956*b*). The source of data is *Demography*, the annual bulletin of the Bureau of Census and Statistics, Canberra.

The Mortality in Childhood.

Mortality rates are lower in childhood than at any other time of life. Indeed, the deaths are so few at ages round about eleven years that sampling errors make it rather difficult to decide which age should be taken as the age of minimum mortality. From the "Australian Life Tables, 1946-8" (Balmford, 1950), it may be concluded that the mortality rates are least at age eleven years in both sexes. The age of this minimum is less definite in females, because the mortality rates are approximately constant over a span of years from eight to thirteen. In 1911 to 1920, the minimum mortality occurred at much the same age, twelve years in both sexes.

TABLE I.

Mortality of Childhood (All Causes) in Australia.

Years.	Deaths per Million *per Annum*.					
	5 to 9 Years.		10 to 14 Years.		5 to 15 Years.	
	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910 ..	2132	1917	1816	1521	1979	1725 (115)[1]
1911 to 1920 ..	2231	1989	1683	1406	1971	1711 (115)
1921 to 1930 ..	1713	1411	1403	1066	1562	1241 (126)
1931 to 1940 ..	1520	1156	1224	839	1368	993 (138)
1941 to 1945 ..	1337	965	1123	744	1228	852 (144)
1946 to 1950 ..	889	619	751	441	827	567 (146)
1951 to 1954 ..	735	538	674	421	708	487 (145)

[1] The figure given in parentheses is the masculinity of the death rates at ages five to fifteen years, that is, $100 \times \frac{\text{mortality rate for males}}{\text{mortality rate for females}}$.

In Table I are given the rates of mortality in Australia at ages five to nine years, and ten to fourteen years and at ages five to fourteen years for a number of periods.

A notable decline in the rates has occurred, the present rates being about one-third those holding in the period 1908 to 1910. The decline is shown graphically in Figure

I, in which the mortality is compared with the corresponding rates for England and Wales, and for New Zealand. Since 1920, excluding the war years, the Netherlands mortality rates (de Haas, 1956) have been of the same order as those in New Zealand, while rates in the United States of America have approximated to the rates in England and Wales. Australia and New Zealand enjoyed lower rates of mortality than these other countries in the latter half of the nineteenth century, but the differences are now small between the rates of any two of these countries.

Infectious Diseases.

The greater part of the reduction in mortality at these ages has been due to the fall in the mortality due to infectious diseases. As has already been pointed out (Lancaster, 1956*b*), some of the declines in the mortality rates due to causes classed as other diseases of the alimentary system and other diseases of the nervous system are also really due to changes in infective disease. We may now briefly review the causes of death, noting that a more detailed description of some epidemiological factors has already been given in the papers already cited.

Pertussis.—Pertussis has not been a major cause of mortality at this age (Table II).

Diphtheria.—The greatest mortality from diphtheria occurs in this age group. There has been a notable decline from about 200 per million *per annum* to about 15 per million *per annum*. Nevertheless, the rates can be reduced (Lancaster, 1956*c*), since they are higher than those of New Zealand, of England and Wales and of a number of other countries.

Scarlatina.—By the beginning of the period studied, 1908, scarlatina had ceased to be the great cause of mortality that it had been in the nineteenth century.

Measles.—The death rates from measles in Australia have not been large at any time during the years of the survey at these ages.

Typhoid and Paratyphoid Infections.—Deaths due to typhoid and paratyphoid infections have fallen to practically zero. In the early periods of the survey, these infections were about as common a cause of death as gastro-enteritis, but they are now negligible.

Gastro-enteritis.—Gastro-enteritis has also declined as a cause of death (Table III).

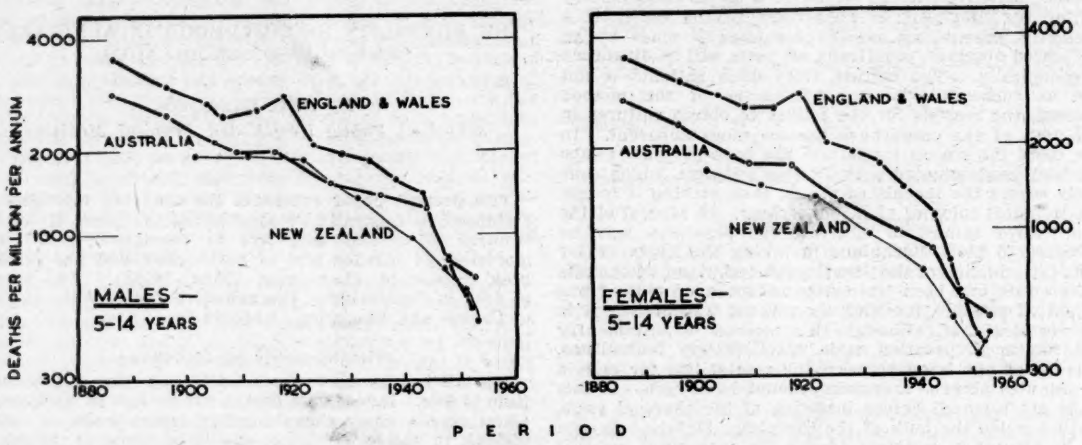

FIGURE I.
A comparison of the mortality of children (ages five to fourteen years) in certain countries.

Tuberculosis.—The death rates from tuberculosis in the earlier periods were greater than those from any of the other infective diseases mentioned so far, with the exception of diphtheria. With better understanding of the case-to-case spread of tuberculosis and more efficient case finding in adults, the mortality in childhood has fallen considerably and may be expected to fall further.

Meningitis.—There has been a substantial decline in the mortality from meningitis, the term being used in a general sense to include meningococcal and all other bacterial forms, with the exception of the tuberculous (Table IV).

Encephalitis and Brain Abscess.—The deaths under the heading of encephalitis and brain abscess include deaths secondary to other causes such as *otitis media*, and some viral encephalitis deaths. There has been no definite trend.

TABLE II.
The Mortality in Australia of Childhood (Ages Five to Fourteen Years).

Years.	Deaths per Million *per Annum*.									
	Pertussis.		Diphtheria.		Scarlatina.		Measles.		Tuberculosis.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910..	13	15	197	223	18	37	10	19	157	172
1911 to 1920..	5	10	245	295	21	31	34	33	108	128
1921 to 1930..	8	8	97	113	17	23	18	16	67	76
1931 to 1940..	5	7	110	112	10	15	13	16	41	47
1941 to 1945..	4	4	76	62	7	10	11	10	30	43
1946 to 1950..	1	2	18	20	1	1	7	14	18	23
1951 to 1954..	0	1	13	15	1	2	3	5	7	4

TABLE III.

The Mortality in Australia of Childhood (Ages Five to Fourteen Years).

Period.	Deaths per Million *per Annum*.							
	Typhoid and Paratyphoid Fevers.		Gastro-Enteritis.		Other Diseases of the Alimentary System.		Appendicitis.[1]	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910	74	87	55	73	186	157	105	72
1911 to 1920	35	47	56	54	140	154	70	70
1921 to 1930	16	22	32	27	115	120	63	57
1931 to 1940	4	4	21	19	111	96	64	49
1941 to 1945	1	1	23	15	106	80	48	40
1946 to 1950	1	1	10	7	46	48	17	16
1951 to 1954	0	0	7	9	26	22	13	10

[1] Already included in other diseases of the alimentary system.

TABLE IV.

The Mortality of Childhood in Australia (Ages Five to Fourteen Years).

Period.	Deaths per Million *per Annum*.									
	Meningitis.		Encephalitis and Brain Abscess.		Tetanus.		Poliomyelitis.		Other Diseases of the Nervous System.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910..	129	86	3	5	46	10	—[1]	—	89	79
1911 to 1920..	116	90	9	9	38	10	—	—	96	83
1921 to 1930..	54	41	21	18	32	12	12	9	88	74
1931 to 1940..	31	23	12	9	31	9	24	15	62	51
1941 to 1945..	50	35	16	12	32	8	13	11	53	38
1946 to 1950..	14	13	12	10	24	8	20	13	45	26
1951 to 1954..	14	10	13	12	15	7	36	21	28	24

[1] Not available (included in other diseases of the nervous system).

TABLE V.

The Mortality in Australia of Childhood (Ages Five to Fourteen Years).

Period.	Deaths per Million *per Annum*.													
	Cancers.		Other Tumours.		Leuchæmia and Hodgkin's Disease.		Other Diseases of the Blood.		Diabetes.		Rheumatism.		Other General.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910 ..	24	16	6	1	14	6	15	9	20	22	40	45	2	3
1911 to 1920 ..	17	12	2	1	18	8	9	7	22	26	52	67	11	10
1921 to 1930 ..	20	15	1	2	24	12	6	6	20	22	72	76	12	9
1931 to 1940 ..	19	15	25	18	26	16	10	10	15	13	58	44	6	7
1941 to 1945 ..	24	20	21	17	25	17	12	8	9	11	51	64	8	8
1946 to 1950 ..	27	24	15	12	35	25	6	7	5	8	27	27	6	5
1951 to 1954 ..	28	26	9	10	46	30	6	6	1	3	20	27	5	6

TABLE VI.

The Mortality in Australia of Childhood (Ages Five to Fourteen Years).

Period.	Deaths per Million *per Annum*.											
	Influenza.		Diseases of the Respiratory System.		Diseases of the Circulatory System.		Diseases of the Genito-Urinary System.		Malformations.		Violent and Accidental Causes.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1908 to 1910	16	14	161	147	114	156	36	44	6	5	446	230
1911 to 1920	43	47	173	159	139	138	46	48	14	14	429	166
1921 to 1930	18	18	146	137	92	92	45	43	22	24	402	167
1931 to 1940	21	17	130	112	57	61	28	42	25	25	394	140
1941 to 1945	9	9	85	80	50	48	37	41	23	34	401	134
1946 to 1950	4	3	55	58	25	25	30	21	30	26	328	125
1951 to 1954	2	1	47	45	11	16	19	19	31	25	300	125

Tetanus.—Tetanus attains its greatest importance as a cause of mortality in this age group. There is some tendency for the rates to fall over the years of the survey, perhaps owing to changes in wearing shoes and in urbanization. This fall could be greatly accelerated by more intensive campaigns of tetanus immunization.

Poliomyelitis.—Poliomyelitis has been a minor cause of mortality. Although the death rates from this cause show no definite trend, falls in mortality from other causes have resulted in its attaining greater importance relative to other diseases in the more recent periods than in the earlier.

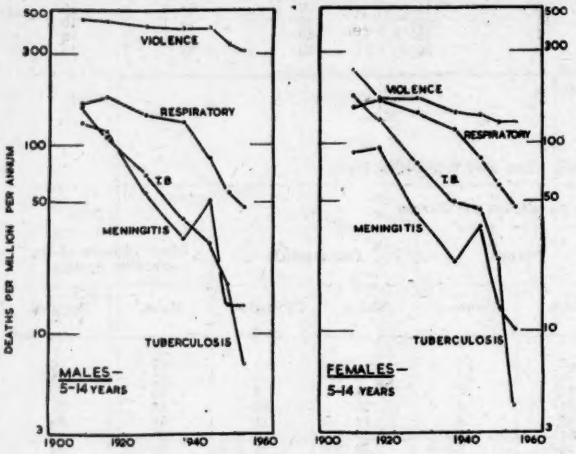

FIGURE IIA.
The trend of mortality of childhood (ages five to fourteen years) in Australia from certain causes.

Other Diseases.

Other Diseases of the Nervous System.—The heading "other diseases of the nervous system" includes convulsions, and possibly largely comprises infections, such as *otitis media*, in the earlier periods (Table IV).

Other Diseases of the Alimentary System.—The heading "other diseases of the alimentary system" does not include gastro-enteritis. Throughout appendicitis has been responsible for about half the deaths. The remaining causes include infections of the pharynx (tonsillitis), tonsillectomy and peritonitis. There has been a large decline in the mortality from this group of diseases.

Cancers and Other Tumours.—Both malignant disease and simple tumours are unimportant causes of death at these ages.

Leuchæmia and Hodgkin's Disease.—Leuchæmia and Hodgkin's disease are considered together, as they could not be separated in the earlier years. There appears to be a tendency to increase in the later periods.

Other Diseases of the Blood and Other General Diseases.—The groups comprising other diseases of the blood and other general diseases are responsible for very few deaths and show only a slight tendency to decrease.

Diabetes.—There has been a notable reduction in the death rates from diabetes, especially since 1940.

Rheumatism.—There has been a fall in the mortality from rheumatism since 1945. Some deaths from late effects of rheumatic fever will have been referred to diseases of the circulatory system, and perhaps the fall in the mortality in that class is really due to a fall in the incidence of rheumatic fever and its sequelæ.

Influenza.—The death rates from influenza are high in the years 1911 to 1920, owing to the pandemic of 1919.

Diseases of the Respiratory System.—Diseases of the respiratory system include the pneumonias and bronchitis and are almost entirely infective. A large decline in the rates over the periods of the survey can be noted in Table VI.

Diseases of the Circulatory System.—There has been a decline in the mortality from deaths in the class "diseases of the circulatory system" of the *International List of Causes of Death*, but it is difficult to be certain of its meaning. The deaths in earlier years were diagnosed as being due to pericarditis, acute endocarditis or more usually organic disease of the heart. It may be that many of them were in fact rheumatic in origin.

Diseases of the Genito-Urinary System.—Since 1945 there has been a fall, although not very pronounced, in deaths from diseases of the genito-urinary system.

Malformations.—No definite trend is apparent in the mortality rate from malformations.

Violence and Accident.—Violence and accident comprise one of the most important groups of causes of mortality. About 40% of the mortality of boys and about 25% of the mortality of girls are now due to these causes. The proportion was less in the earlier periods. The fall in mortality in this class has been small, especially in view of improvements in the treatment of accidents.

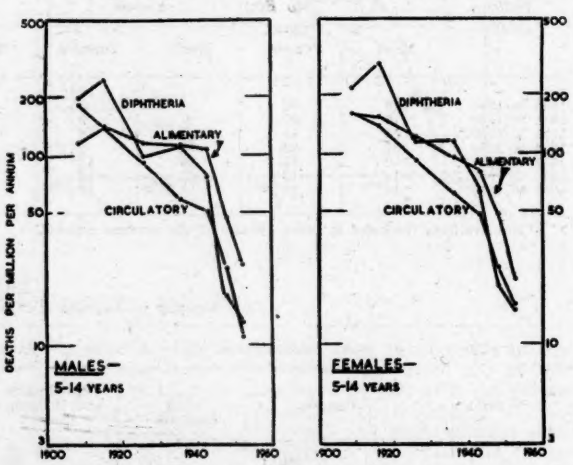

FIGURE IIB.
The trend of mortality of childhood (ages five to fourteen years) in Australia from certain causes.

Discussion.

The mortality in childhood in Australia has fallen over the years of the mortality survey. Australia, together with New Zealand, enjoyed a fall in mortality over the latter part of the nineteenth century and the first half of the twentieth century, which was probably due to social factors, as has already been stated in a previous paper (Lancaster, 1956*b*). Similar falls have occurred in other countries, beginning at a later time than in Australia. The rates in such countries as England and Wales, the United States of America and the Netherlands are now all of the same general order.

These falls in mortality have been due to changes in the incidence of infective disease. Therapy possibly played little part until after 1940 or even later. In particular, the change in mortality was largely independent of the medical or surgical therapy of the non-infective diseases, the only disease of this latter class contributing much to the fall being appendicitis. Although there has been an absolute fall in the rates from violence and accidents, the mortality from this group has fallen relatively less than that from other causes, and now these deaths must be considered to be the major problem of mortality.

Acknowledgements.

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Reports of Cases.

RHABDOMYOSARCOMA OF SKELETAL MUSCLE: ANOTHER FIVE-YEAR SURVIVAL.

By THOMAS HAMILTON,
Newcastle, New South Wales.

RHABDOMYOSARCOMA, the malignant form of rhabdomyoma, is usually deadly to the patient who has the misfortune to be afflicted with one. The tumours are made up of striated muscle cells in all stages of differentiation from adult to embryonal forms.

Since 1854 many studies of striated muscle tumours have been published. Perhaps the most alarming in Australia was that by Thompson (1951), who quoted Stout (1946) as having reported only four patients out of 121 cases as being alive and symptom-free after five years, although there were other patients who had long survival periods but with a persistent tumour. Of Stout's patients, 108 had received treatment.

J. V. Hurley (1954), who wrote an excellent review, opined that wide surgical excision was the basis of rational treatment. He thought that radiotherapy had only a slight effect on these sarcomata.

Clinical Record.

The present patient, a woman, aged forty-four years, was first examined on April 24, 1951, at the out-patient clinic of the Royal Newcastle Hospital. She then had a small ganglion-type tumour the size of a cherry on the lateral aspect of her right elbow joint. Removal was advised, but she was so terrified of operations that she said she would wait and see what happened.

On July 3, 1951, she attended again, because the tumour had trebled in size in the previous week. It was still mobile and she was strongly advised to enter hospital as soon as possible. The swelling had now been present for five months.

At operation on August 5, 1951, the tumour was removed. It consisted of a large, soft mass attached to the fascia overlying the lateral epicondyle. A biopsy carried out by Dr. J. R. S. Douglas, director of pathology at the Royal Newcastle Hospital, revealed that the tumour was of a high degree of malignancy, with the structure of an acid-fast mitotic rhabdomyosarcoma. Dr. Douglas agreed with me that there would be little use in removing the patient's arm, and that it would be wise to keep her under close observation in the hope that no recurrence would take place. Neither of us know of any treatment which would be certain of prolonged success.

On August 21 the patient reported that she had had a fall on the elbow during one of the electricity "black-outs" which were common in the district at that time. This had caused a small hæmatoma under the wound scar.

On September 18 she was found to have a recurrence of the tumour at the posterior end of the wound. Amputation of the arm was again considered in consultation with the patient and her husband, but she stated that "she would rather do anything than have the arm off".

I then referred her to Dr. Harold Ham in Sydney, with a plea that deep X-ray therapy be tried on the tumour area. By October 16 she had had 13 treatments with deep X-ray therapy and the recurrent lump had become fibrosed and smaller in size. From February 2, 1952, she had nine more applications in a course of deep X-ray therapy at the Royal Prince Alfred Hospital.

On February 11, 1952, Dr. W. C. Woods, radiotherapy registrar at the Royal Prince Alfred Hospital, notified me that the patient had had a heavy course of deep X-ray therapy to her right elbow. This had been applied to a nodule measuring 1·6 centimetres at the point of the elbow. Further treatment had been planned, but in view of the fact that the nodule had lessened in size it was withheld.

On April 7, 1952, the patient was examined again by Dr. Ham, who wrote:

> The recurrent sarcomatous tumour in the right elbow region appears to have cleared up completely after her intensive deep X-ray treatment, and I feel that it is justifiable to watch at present. She has always, of course, been very scared of the idea of any amputation.

On April 22, 1952, the recurrent tumour had disappeared. By November 18 she had regained more than her normal weight, and there were no signs of any recurrence.

On March 16, 1953, she was affected with sunburn to the elbow, and this left a small, hard scab in the centre of the scar. On May 19 this had cleared up and she was left with a dry radiation scar which she still bears.

On October 2, 1956, she was shown at a clinical evening at the Royal Newcastle Hospital as a five year survivor with no signs of any metastases and in possession of a good right arm which, but for the success of deep X-ray therapy, might have been sacrificed.

Discussion.

From the circumstances of the case two surgical lessons can be drawn:

1. The surgeon must try everything within his knowledge for the benefit of his patient, no matter how apparently hopeless her condition.

2. The improvement in deep X-ray therapy during the last ten years will possibly bring more sufferers from sarcomata within the prospects of a permanent cure.

There will be disappointments. During the past two years I have been saddened by the loss of a boy patient, aged nine years, with a rapidly advancing rhabdomyosarcoma of the left side of his neck, who in spite of all forms of therapy did not survive for longer than six months.

Acknowledgement.

I am indebted to Mrs. K. Pluck, librarian to the Royal Newcastle Hospital, for her help with the bibliography.

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Reviews.

Dermatology. By Donald M. Pillsbury, M.A., D.Sc. (Hon.), M.D., Walter B. Shelley, M.D., Ph.D., and Albert M. Kligman, M.D., Ph.D.; 1956. Philadelphia and London: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical), Limited. 10" × 6¼", pp. 1331, with 564 illustrations. Price: £10.

THIS text-book, from the well-respected School of Dermatology at the University of Pennsylvania, lives up to what one would expect from the contributions of the authors to

the literature. It has, in high degree, the most important quality required in a text-book: it is "readable". The illustrations are profuse, clear and apposite, and some are of the "cartoon" type. At the end of many chapters is a summary of the main points made. Perhaps the most pleasing feature, especially in an American text-book, is the absence of innumerable references to the literature scattered through the text and the recital of what numerous other workers consider or think. The authors state very clearly what is their own opinion based on their own experiences. In cases in which their opinion differs from that of the main body of dermatologists—for example, in the value of X-ray therapy in certain dermatoses—they set out quite frankly the opposing view.

The treatment routines suggested in various diseases in which no specific treatment is available offer a preferred regime with perhaps two alternatives, the rationale being set out clearly and logically. It is of interest in this respect to note, as one does in most books from other climates, that drugs are used in ointments in much higher concentration than is possible in this part of the world.

One chapter of especial interest to readers here, of course, is that on tumours of the skin. One finds a different outlook in a clinic where these tumours are infrequently seen from that in a Sydney outdoor clinic, where perhaps 50% or more of the patients presenting in an afternoon are suffering from cutaneous malignant or premalignant disease. One reads with amused tolerance that the method of choice of treating a basal-celled carcinoma is electrodesiccation and curettage except when the tumour is over 0·5 centimetre in diameter. As in the State of Texas, the tumours here are bigger, and the treatment is certainly by either radiotherapy or surgery.

The chapter on psychocutaneous medicine is written with clarity and understanding. As the authors point out, even disbelievers are constant practitioners of psychotherapy. "When one observer gets good results by diet therapy, another by allergic management, another by eradication of septic foci and when the practitioner of one school is unable to repeat the results of the other, it is probable that large doses of the doctor himself are the curative agent."

At its price of £10 the book is not inexpensive, but it will find a place in the library of all dermatologists and of all physicians who are interested in dermatology.

Diseases of the Skin. By Richard L. Sutton, junior, A.M., M.D., F.R.S. (Edin.); Eleventh Edition; 1956. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical), Limited. 10" x 7", pp. 1501, with 1972 illustrations. Price: £16 4s. 6d.

THE eleventh edition of this book with 1972 illustrations is a monumental work of high quality, a worthy successor to the tenth edition, in which the author was associated with the late Richard L. Sutton, senior.

The book is made more voluminous by the inclusion of new descriptions and over 500 additional illustrations; but the text is admirably condensed, and the use of 8-point and 10-point type has enabled the author to deal adequately with practically all known skin diseases, giving each condition its relative importance. As a reference book it is of great value, and dermatologists will appreciate the ease with which original articles can be traced from the detailed bibliography. Documentation is mainly contained in the text; but it must be admitted that the conventional end-of-the-chapter bibliography has certain advantages.

The opening chapters on anatomy, embryology and pathology contain many of the best photomicrographs yet published in a general text-book of skin diseases.

In the chapter on treatment, all varieties of medicaments used in dermatological treatment are listed in alphabetical order and briefly described, or their location in the text is indicated. The advantages and disadvantages of X-ray therapy are fairly considered, and the author is not afraid to advise a surgical approach to a problem. The brief reference to ultrasonic vibrations in treatment is interesting, and supports the opinion that it has no great use in dermatological therapy.

Brief reference with illustrations is made to atomic energy injuries, and the bibliography on this subject would greatly help the student of these injuries.

The section on contact dermatoses and the etiological agents contains a wealth of detail relative to the areas affected and to the trades and industries concerned. Emphasis is laid on the purely corroborative evidence of patch testing, and on the fact that a patch test "is capable of initiating previously non-existent allergy".

No book can deal with all details of every phase of dermatology; but in this book the section on infantile eczema is somewhat disappointing and does not reveal as much original thinking as most of the book does. Other omissions include the great efficiency of dimethylphthalate as an insect repellent and the use of steroids in the treatment of *pyoderma gangrenosum*. A notable omission is the use of chloroquine in the treatment of rosacea, and we cannot agree that "Roentgen therapy is of little value" in the treatment of this disorder. It is of great use in the papular form of the disease.

By and large this book must be regarded as a necessary part of any dermatologist's library.

Modern Trends in Dermatology (Second Series). Edited by R. M. B. McKenna, M.A., M.D. (Camb.), F.R.C.P. (Lond.); 1954. London: Butterworth and Company (Publishers), Limited; Sydney: Butterworth and Company (Australia), Limited. 10" x 7", pp. 348, with 58 illustrations. Price: 86s. 6d.

THIS second series of "Modern Trends in Dermatology" under the able editorship of R. M. B. Mackenna has been eagerly awaited. Twenty-two eminent dermatologists from both sides of the Atlantic and from Europe have contributed to this edition, giving it a flavour of internationality that is quite different and refreshing. The opening chapter on ecology in dermatology is an example of this different approach which marks the whole book. "Little more than a hundred years ago a war was fought and won in India before news of it reached this country. Today the sensitive patient may have his eczema aggravated by anxiety as to what a statesman several thousand miles away may say this evening." Ida Macalpine, who works in close collaboration with the editor, has contributed the chapter on psychosomatic dermatology, which reviews with critical observation the current views on this subject. One still finds it difficult to believe that "in many cases the beginning or exacerbation of the pruritus (ani) was traceable to the reactivation in adult life of infantile unconscious fantasies centering on procreation taking place in the abdomen or intestines". The commonest cause of *pruritus ani* in this city is the exhibition of broad-spectrum antibiotics.

Nils Danbolt, of Oslo, has written on sarcoidosis, of which he has had a vast experience; this is a most lucid chapter on this uncommon disease.

The contribution by Sulzberger on cortisone and ACTH in dermatology is a model of clarity, information and value, and will, at this time especially, be avidly absorbed.

I. G. Williams has written a short but interesting account of the use of β-ray emitters in the form of radioactive isotopes in the treatment of some skin diseases.

This book is a "must" for all dermatologists.

Diabetes Mellitus: Handbook for Physicians. By Howard F. Root, M.D., Sc.D., F.A.C.P., and Priscilla White, M.D., Sc.D., F.A.C.P.; 1956. New York: Landsberger Medical Books, Incorporated. 8¼" x 5¼", pp. 346, with illustrations and tables. Price: $7.00.

FOR many years the authors have collaborated with Dr. Elliott P. Joslin to produce that meaty classic "The Treatment of Diabetes Mellitus". The present volume is one of a series of "Handbooks for the General Practitioner". It is a practical guide in dealing with the diabetic patient. Only brief mention is made of etiology, pathology and fundamental biochemistry; but the details of treatment with diet and insulin are admirably set out, and the prevention and management of all the complications are suitably stressed.

In the chapter on diabetes and pregnancy, Priscilla White outlines her own practice and advocates the use of hormones in selected cases. In dealing with the juvenile patient she combines a sympathetic approach with firm guidance and control.

All through there is insistence on meticulous supervision of the patient, so that fluctuations of blood sugar levels and urinary excretion of glucose are kept to a minimum. The authors are convinced, and offer good evidence in support of their conviction, that careful control reduces the incidence of late vascular complications. They have no time for the completely free diets: "Such dietary programmes embrace standards of diabetic control which should appeal only to those physicians desiring to indulge the patient's appetite as well as to avoid expending time in teaching patients, while ignoring late vascular and neuropathic complications."

The book is up to date. The use of lente insulins is described, and a brief account is given of the new antidiabetic sulphonamide drugs for oral administration. This

handbook contains a vast amount of information, distilled from the unrivalled experience of the authors, which should make it admirably suited for the day-to-day use of the physician in practice.

Differential Diagnosis of Internal Diseases: Clinical Analysis and Synthesis of Symptoms and Signs on Pathophysiologic Basis. By Julius Bauer, M.D., F.A.C.P.; Second Edition; 1955. New York and London: Grune and Stratton, Incorporated. 9″ × 6″, pp. 1004, with 66 illustrations. Price: $15.00.

FIVE YEARS after the book's initial appearance, a second edition of "Differential Diagnosis of Internal Diseases" by Julius Bauer has been published. No major alterations have been made, but the text has been revised and inevitably expanded, and many of the references in the bibliography have been replaced by more recent ones. The author's claim to have heeded constructive criticism of the initial edition is borne out by reference to a previous review; but here and there one encounters statements which do not conform to personal experience—for example, that "bronchogenic carcinoma as contrasted with mediastinal tumour does not often cause paralysis of the recurrent nerve with subsequent hoarseness, and practically never swelling and cyanosis of the face by obstruction of the superior vena-cava". Most new diagnostic procedures are mentioned; but the author states that the smallest risk of a diagnostic procedure is unjustified unless the expected diagnostic information can be obtained in no other way. For the student, both undergraduate and post-graduate, the book is a useful and stimulating adjunct to a standard text-book of medicine, and it could well assist the physician faced with a diagnostic problem.

Essential Urology. By Fletcher H. Colby, M.D. Third Edition; 1956. Baltimore: The Williams and Wilkins Company. Sydney: Angus and Robertson, Limited. 9¼″ × 6¼″, pp. 666, with illustrations. Price: 88s.

THIS book continues its popularity, necessitating annual reprints, and the author is keeping it well abreast of recent developments by now producing a third edition in six years. The form has not been altered, and although all chapters have been revised, it is mainly in the chemotherapeutic and antibiotic field that changes have occurred. A good summary is given of the treatment of renal infection, with the exception that no mention is made of the insoluble sulphonamide drugs, which often have proved helpful.

It is a little disappointing to see no change in the treatment of prostatic hyperplasia. It is thought that more consideration might be given to this condition, as it forms so large a part of urological practice and is the subject in which resident medical officers, for whom the book is written, are most interested. The author is still not familiar with the work of the late Harry Harris and of the enormous improvements he made in the transvesical operation.

By contrast, a good deal more is given about malignant neoplasms of the prostate.

No mention is made of the infections or of the physiological changes seen in pregnancy.

In the preface the author states that the work should prove useful to students and residents, and there is no doubt that this is true. It is a very good summary of urology. It is clearly written, devoid of padding and authoritative, with many up-to-date references at the end of each section for more detailed reading. One hesitates to suggest an increase in size in a work of this nature; but resident medical officers would certainly derive great help from a chapter on minor urological procedures, including cystostomy.

One Doctor in His Time. By Bethel Solomons, M.D., F.R.C.P.I., F.R.C.O.G., M.R.I.A.; 1956. London: Christopher Johnson Publishers, Limited. 5½″ × 8½″, pp. 224, with illustrations. Price: 18s.

IT is something of an achievement to be able to write an autobiography so full of diverse interests that it may be read with pleasure and profit by a public entirely unfamiliar with the local scene. Dr. Bethel Solomons, a distinguished gynæcologist who practised for many years in Dublin and served a full term as master of the famous Rotunda Hospital, has made good use of his retirement from professional activities by writing an entertaining account of his varied experiences as a doctor and a loyal citizen of the Irish Republic.

The whole story, which exactly covers man's allotted span of three score and ten years, is written without any pretence to literary perfection in style or expression, but is instinct with simplicity, modesty, sincerity and charm. The writer has obviously lived at peace with the whole world, and his outlook on life is uniformly wholesome and sensible, even if a few sceptics in the medical profession may wonder whether such unalloyed happiness and unfailing human kindness are truly indigenous to his native heath. Some kind of genius derived from his Jewish ancestry may have helped to make Dr. Solomons an author, a medical specialist, an artist, a literary critic, a philanthropist, a social worker and a religious reformer; and besides all this, he was a true sportsman who was good enough at the game to represent his native Ireland ten times in international Rugby football.

In the course of a long professional career interspersed with many excursions abroad, Solomons made friendly contacts with a number of outstanding personalities in most spheres of human activity, so that this small book of interesting reminiscences should appeal to a wide range of readers.

Pathology. By Peter A. Herbut, M.D.; 1955. Philadelphia: Lea and Febiger. 10″ × 7″, pp. 1228, with 651 illustrations and six colour plates. Price: £8 16s.

THIS is another text-book of pathology added to the long list of those already existing. The author mentions in his preface that the book is meant for the student of medicine, both undergraduate and graduate. In this we do not think he has succeeded. In some parts far too many detailed facts are listed for the undergraduate, while on the other hand there is not sufficient discussion of problems for the post-graduate student. From the introductory chapters the technique of performing an autopsy could well be deleted, and the historical summary (it can hardly be called a review) is misleading in many ways. For example, Julius Cohnheim is mentioned only in relation to his rather obscure and forgotten theory on tumours, while his basic experimental work on inflammation has found no place, not even in the chapter on inflammation. But then the book generally is singularly free of quoted work. Place is given to some pathologists whose names are hardly known outside the United States of America, while Aschoff's name is absent from the historical review.

The illustrations are mostly not up to standard, and the coloured ones, which seem to have been chosen rather at random, are only fair. Some illustrations serve no purpose at all apart from illustrating a rarity—for example, Figure 96, in which a congenital glycogen tumour of the left atrium and a lipoma of the pericardium are depicted.

The only commendable feature of this book is the fact that it gives the explanation and derivation (from Greek or Latin) of the medical terms; this is certainly enlightening to the uninitiated, and in many instances also to the more advanced. However, this does not make good the many shortcomings of this book, which cannot be recommended to the student of pathology.

Medical Physiology. Edited by Philip Bard; Tenth Edition; 1956. St. Louis: C. B. Mosby Company; Melbourne: W. Ramsay (Surgical), Limited. 10″ × 7″, pp. 1445, with 438 illustrations. Price: £7 14s.

THE first edition of this text-book dates back to 1918, when it appeared as Macleod's "Physiology and Biochemistry in Modern Medicine". Professor Philip Bard, Professor of Physiology at the Johns Hopkins University, became the editor for the ninth edition in 1941 and is again responsible for the present edition. However, because of the radical revision that was made, the title has now been changed to "Medical Physiology". Over the successive editions the number of contributors has gradually increased; there were eleven contributors for the ninth edition and the present volume has fourteen. However, nine of the fourteen concerned with this edition were also contributors to the 1941 edition.

In view of the success of previous editions, the outstanding qualifications of the contributors and the extensive nature of the revision, the present edition is somewhat disappointing. This is almost entirely due to the long delays that have occurred in the publication, which have made the text much more out of date than it should be. The editor refers to the publication delays in his preface, but gives no further details. From an examination of the various contributions it seems that many of them were probably completed as early as 1951 or 1952 and some possibly earlier

than this. Thus in the case of the section on special senses there is only one reference to an original paper later than 1947. The effect of these delays is most clearly apparent in the sections dealing with the fundamental properties of nerve and muscle and junctional transmission. There is virtually no reference to modern ionic theories of nervous action. However, many of the other sections, notably those on the circulation and respiration, are still sufficiently up to date and have been very ably presented. The chapter on hæmodynamics, for example, is good and is in line with Dr. Bazett's considerable contributions to this subject. Again, the chapter on blood volume, hæmorrhage and shock by Professor M. I. Gregersen is one of the best accounts at present available in text-books of physiology. The chapter on pulmonary gas exchange is quite up to date and incorporates many of the more recent advances in respiratory physiology. The editor has himself made the major contribution to the sections dealing with regional neurophysiology. They undoubtedly provide the best text-book account at present available of modern experimental neurology, and bring together much material not otherwise readily available. The general impression, therefore, is that the book is rather uneven in quality.

It is obviously impossible in a brief review to make a critical assessment of a book of 1421 pages. However, one or two general comments may be made. It is too detailed to be recommended for general use by medical students. Furthermore, the book is uncomfortably bulky, weighing between seven and eight pounds. This undoubtedly detracts from its general usefulness as far as students are concerned. "Medical Physiology" is therefore essentially a text for reference. It will be particularly valuable to the advanced student who is able to read critically. The views of men of such high scientific standing as those who have contributed to this volume are always worthy of close study.

Cancer Cells. By E. V. Cowdry; 1955. Philadelphia and London: W. B. Saunders Company; Melbourne: W. Ramsay (Surgical), Limited. 10" x 6½", pp. 694, with 137 illustrations. Price: £8.

IT is extremely interesting to read a book on cancer problems written by such a histologist of world fame as Cowdry. The approach to the subject is quite different from what is found in the usual books or chapters dealing with tumours. The book is full of thought-stimulating ideas, and presents the problems in relation to the malignant cell. Many accepted ideas are analysed with mathematical precision of thought, and the basic problems are exposed.

The book, though excellently written, is not easy to read, as it deals with such a mass of facts. These many facts and thought-provoking ideas make this a book to read in stages and to reread many times, although no special chapter is particularly difficult to follow. Although not everyone will be willing to follow the author's ideas and concepts all the way, there is singularly little dogmatism, if any. An extensive bibliography covering 63 pages will be of considerable help to the research worker in any aspect of the cancer problem, as practically all facets are dealt with. This book is certainly not written for the undergraduate student, and only a small fraction of post-graduate students will find in it some of the facts they want for their particular degree. It is obviously not written for any particular specialty in medicine, but it seems likely to be invaluable to every student of tumour problems. It is a book which ought to be in the library of every department of pathology, and easily available to those who have a more intimate interest in tumour problems.

Micro-analysis in Medical Biochemistry. By E. J. King, M.A. (McMaster), Ph.D. (Toronto), D.Sc. (Lond.), F.R.I.C., and I. D. P. Wootton, Ph.D. (Lond.), M.A., M.B., B.Chir. (Camb.), F.R.I.C.; Third Edition; 1956. London: J. and A. Churchill, Limited. 8½" x 5½", pp. 303, with illustrations. Price: 22s. 6d.

THERE has been considerable revision of the well-known manual "Micro-Analysis in Medical Biochemistry". The third edition has been written by E. J. King and I. D. P. Wootten and extends to 292 pages.

New chapters have been included on the following subjects: the control of laboratory accuracy and a system of quality control; electrophoresis of plasma proteins; techniques of metabolic balance studies; flame photometry of sodium, potassium and calcium; radioactive isotope tests.

The sections of the book concerned with photo-electric colorimetry have been recast, and an extensive account of spectrophotometric analysis, including particular methods in which ultra-violet and infra-red rays are used, has been included. New procedures include the following: the estimation of free and ester cholesterol by a ferric chloride method, of uric acid by uricase, and of true creatinine by adsorption and elution; the Markham micro-Kjeldahl method; the biuret method of estimating plasma proteins; the antipyrine method of estimating total body water, serum iron estimation; paper chromatography for the determination of urinary sugar content; the tubeless test meal estimation; the pyruvate metabolism test; the water concentration test; the inulin clearance test; a vitamin *A* absorption test.

The standard of production in regard to such matters as reference tables, index and reagent grades is excellent. The style of writing is accurate and well suited to a book of this kind. This is a valuable book representing the accumulated experience of a well-established and important medical laboratory.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"The Human Machine", by Adolphe Abrahams; 1956. Victoria: Penguin Books Proprietary, Limited. 7" x 4¼", pp. 200. Price: 5s. 6d.

A popular account of the human body and how it works.

"World Trends in Cardiology: Volume I, Cardiovascular Epidemiology", edited by Ancel Keys, Ph.D., and Paul D. White, M.D.; 1956. New York: Paul B. Hoeber. 8½" x 5½", pp. 203, with illustrations of tables and figures. Price: $4.75.

Selected papers from the second World Congress of Cardiology held in September, 1954.

"Enzyme Antigen and Virus: A Study of Macromolecular Pattern in Action", by F. Macfarlane Burnet, Kt., F.R.S., F.R.C.P.; 1956. Cambridge: University Press. 7½" x 5", pp. 201, with illustrations of figures. Price: 18s.

Described by the author as a "speculative essay on protein synthesis".

"The Surgical Clinics of North America: Symposium on Pediatric Surgery"; Nationwide Number; December issue; 1956. Philadelphia and London: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical), Limited. 9" x 6", pp. 282, with many illustrations. Price: Cloth binding, £8 2s. 6d. *per annum*; paper binding, £6 15s. *per annum*.

Contains 19 articles on various aspects of pædiatric surgery, including anæsthesia, supportive treatment, diagnosis and operative procedures.

"The Compend: A Compendium of Ethical Proprietaries Used in Medicine and Pharmacy", compiled by W. Hetherington, F.P.S.; Addendum for the Year 1956; 1957. Bristol: John Wright and Sons, Limited. 7" x 4", pp. 64. Price: 4s.

Includes 225 new monographs with other information about proprietary medicines.

"Operative Surgery", under the general editorship of Charles Rob, M.C., M.Chir., F.R.C.S., and Rodney Smith, M.S., F.R.C.S.; Volume I, Introductory, Surgery of Trauma, Abdomen (Part); Volume II, Abdomen (Completion); 1956. London: Butterworth and Company (Publishers), Limited. 11" x 8½", pp. 795, with many illustrations. Price: £6 10s. per volume.

Each operation is described in pictures stage by stage. The text is short and secondary.

"A.M.A. Scientific Exhibits, 1956", sponsored by Council on Scientific Assembly, American Medical Association; 1956. New York: Grune and Stratton, Incorporated. 11" x 8", pp. 411, with many illustrations. Price: $10.00.

Scientific exhibits presented at the annual meeting of the American Medical Association in 1956.

"Children's Eye Problems", by Emanual Krimsky, M.D.; 1956. New York and London: Grune and Stratton, Incorporated. 10" x 7", pp. 187, with many illustrations. Price: $6.00.

For the pædiatrician and the general practitioner, as well as for the ophthalmologist.

The Medical Journal of Australia

SATURDAY, MARCH 30, 1957.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of the article. The abbreviations used for the titles of journals are those adopted by the Quarterly Cumulative Index Medicus. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

RADIATION HAZARDS AND THE MEDICAL PROFESSION.

STATEMENTS about the predictable and the possible effects of atomic explosions on the human race are "news", whether their source is reliable or irresponsible. The pity of it is that a subject of such importance should have become a political football and that much of the thinking about it has taken on high emotional colour. As a result, speculations about atomic bombs and radioactive "fall-outs", important though they are, have assumed unwarranted significance and have drawn attention away from certain immediately more serious dangers in the same field. Hazards from radiation are not new. As Mitchell R. Zavon[1] has put it, X rays and radium, the same horse in another colour, have been used in medicine and by physicians for half a century. Why is it, he asks, that the physician remains in awe of the atomic bomb and radioactive fall-out, but thinks nothing of his X-ray equipment or the radium in his desk drawer? The answer Zavon offers seems sufficient: "Familiarity breeds contempt." The mutilation and suffering of pioneer workers in both diagnostic and therapeutic radiology, whether the result of unhappy ignorance or of deliberate and courageous acceptance of a known risk, are, of course, well known; they make an important and exciting chapter in medical history—past medical history. Their relevance to the present is too seldom appreciated. Yet at the present day, as Sir Macfarlane Burnet has made clear in his presidential address to the Australian and New Zealand Association for the Advancement of Science, published elsewhere in this issue, test atomic explosions are of much less significance as a source of ionizing radiation than is the medical use of X rays. It is as well that we should realize that this is so, and also that the general public has, naturally enough, become as *blasé* about the use of X rays and other sources of radiation as has our own profession. Zavon states that it is not unusual to learn of the patient who goes to the physician who has a fluoroscope in preference to the man who does not include the use of that device in his physical examination. The public has come to expect the use of the X-ray apparatus and even to demand it. These statements, made in the United States, are probably not too far out in our own country.

This is not put forward as a matter for alarm. Much less is it desired to minimize the vital role of X-ray diagnosis and of radiotherapy in medical practice. The thing that matters is that we should realize what we are doing. One fairly striking example will illustrate the point. Reference was made in these columns on December 22, 1956, to certain findings from an investigation in England which suggested that diagnostic X-ray examination of the mother might cause leuchæmia or cancer in the unborn child. The point was not at that stage proved, but the evidence was highly suggestive. However, even if the point is proved beyond any doubt, there will still be occasions when X-ray examination of the pregnant mother will be the right course to follow. Only let us not undertake it lightly or as a matter of routine. On the other hand there seems little if any excuse for X-ray examination of the feet of customers in shoeshops; the amount of radiation is very much greater than is generally realized, and it adds unnecessarily to the exposure of the individual and to the difficulty of keeping within the maximum permissible dose of radiation if more important indications for exposure should arise. It should be abolished.

The price that we may be called upon to pay for carelessness in these matters is variously estimated. The possible genetic effects are referred to in Burnet's presidential address and were discussed in a leading article in the issue of April 23, 1955. Perhaps the most significant thought that arises from this aspect of the question is that the price may be left for future generations to pay; whether or not we care for their curses, our consciences should not let us easily neglect our duty to the unborn. There are other more obvious effects. Zavon sums up the effect of radiation as one of accelerating the aging process. It can cause a shortening of the life span. It can also cause many of the degenerative changes associated with the aging processes, such as carcinoma, sarcoma and cataract formation. An increased incidence of leuchæmia reported amongst medical men has been attributed to radiation, and the evidence is hard to deny. On the other hand, the danger of sterility from radiation has assumed false proportions. Indeed, Zavon describes it as largely a folk tale, pointing out that it requires more radiation to cause sterility than it does to cause death, unless the dose is localized to the reproductive organs. Thus death will usually occur before sterility; and it is a dangerous fallacy to think that because the power of procreation has not been impaired by ten or fifteen years of radiation exposure, no significant effects have resulted.

It is apparent that a need exists for continued education of the general public, of all medical practitioners and even

[1] *J.A.M.A.*, October 6, 1956.

of specialists in radiology in the hazards associated with radiation. It would be out of place here to tread on the specialist's ground, and in any case the question of protection in radiological practice was considered in these columns on March 17, 1956. The most we need do is to quote five thought-provoking questions, posed by Zavon, that are of concern to the whole profession:

> 1. What results from radiation therapy of non-malignant conditions would be as well or better accomplished by other modalities of treatment? 2. What radiodiagnostic procedures are of value in specified situations and how often is it worthwhile to repeat the same procedure? 3. Is there really any value in limiting radiodiagnostic procedures in females in the reproductive age to the period immediately after menstruation as has been suggested? 4. Can adequate training in specific diagnostic or therapeutic techniques be given all medical practitioners as well as the specialist in order to satisfy minimum professional needs? 5. Will the radiologist assume responsibility for the training of other physicians in radiation in order to satisfy their minimum requirements in the use of radiation?

There is an urgent call to the medical profession to accept responsibility in this field. An important statement prepared by the United Nations Scientific Committee on the Effects of Atomic Radiation appears elsewhere in this issue under the heading "Medical Practice". It deals in a balanced and constructive way with the responsibilities of the medical profession in the use of X rays and other ionizing radiation, and suggests a plan to make possible a decrease in the total medical irradiation of the population while the true values of the medical uses of radiation are preserved and increased. It warrants careful consideration and thought, as do all aspects of the subject. Zavon asks whether the physician, the physicist or the engineer is to assume responsibility for the health of the population in relation to actual or potential exposure to radiation. Surely it is, as he asserts, a legitimate medical responsibility, which should not be left to be assumed by others less able by training to evaluate the potential biological hazard. This is a matter for the profession's sense of duty. A quite different but salutary thought is that neglect of these matters and any suggestion of a casual approach to the use of sources of radiation in practice could lead inevitably to regulations and restrictions on practice that on general principles we would wish to avoid. Undoubtedly they can be avoided, for, as Burnet has said, it should be possible to reduce the hazards of medical uses of radiation to negligible proportions. The hazards that may arise from future developments in the use of nuclear energy are another matter.

Current Comment.

THE HISTORY OF A GREAT HOSPITAL: L'HÔTEL-DIEU.

HOSPITALS and the care of the sick are so closely bound together at the present day that the existence and functioning of appropriate institutions are taken as a matter of course. It was not always so; but in appreciation of man's occasional humanity to man, we may remember that the origin of the hospital system dates from pre-Christian times. No doubt the Christian concept of duty to one's neighbour has had a profound effect on the development of hospitals, so that at their best they have provided more than treatment for sick bodies. This has been admirably summarized by Elizabeth Barrett Browning in four lines from "Aurora Leigh":

> I think it frets the saints in heaven to see
> How many desolate creatures on the earth
> Have learnt the simple dues of fellowship
> And social comfort, in a hospital.

G. Menegaux[1] has written a careful and interesting account of the history of the *Hôtel-Dieu* of Paris, a great hospital whose origins are lost in the mists of antiquity. It is said to have been founded in the seventh century by Saint Landry, the eighth Bishop of Paris, in the time of Clovis II; the only legal document on the subject that still remains is a charter of the year 829, instructing the Bishop of Paris to endow the hospice. (In past ages such an institution was a refuge for all who were destitute, as well as for the sick and wounded.) At that time, long before the great cathedral of *Notre-Dame* was built, three or four small buildings close to Saint Christopher's Church comprised the humble beginnings of the hospital; it remained there until 1182, when Louis VII ordered its demolition. The new hospital, by the choice of Philippe-Auguste, was built on the right bank of the small arm of the Seine where now there is nothing but the square of Charlemagne. This mediæval *Hôtel-Dieu* flourished until the end of the nineteenth century. Meantime the cathedral had been built, and by the middle of the sixteenth century the hospital was encroaching on its southern portal. From Menegaux's description it must then have been an imposing edifice. In this and the next century it was necessary to expand the hospital still further, since it was never able to cope with the needs of the population, so terribly did the regularly recurring epidemics of plague aggravate the situation. As an example, during that of 1532 the *Hôtel-Dieu* had to cope with 68,000 victims. During the reign of Henri IV the hospital took its first step on to the left bank of the small arm of the Seine. At this time also began the construction of distant annexes, the "*Sanitat de Sainte-Anne*", and the "*Hôpital Saint-Louis*". These two subsidiary hospitals were theoretically reserved for patients suffering from contagious diseases, especially during epidemics. In practice they were kept open all the time, and helped to relieve the perpetual overcrowding in the main hospital. In 1632 further extensions were carried out by the construction of the *Pont-au-Double* near *Notre-Dame*. On this was erected a two-storey building, "*Le Rosaire*", for a maternity hospital. Previously these patients had been relegated to the basements. On the bridge itself a public right-of-way was established, and the *Hôtel-Dieu* was authorized to charge a toll fee of one "double pound"[2] (from this the bridge took its name) for a man walking and six deniers for a horseman. In the eighteenth century the Saint-Charles building, which had been erected in the reign of Henri IV, was able to be extended owing to the demolition of the *Petit-Châtelet*, and soon accommodated two-thirds of the patients in the *Hôtel-Dieu*; the wards on the right bank were progressively freed for general purposes. From then on the segment of the small arm of the Seine lying between the *Petit-Pont* and the *Pont-au-Double* became in a sense annexed to the *Hôtel-Dieu*. That part of the river at that time provided a striking picture of "life in the raw", into which was drawn willy-nilly that portion of the hospital which looked down upon it. A little imagination, combined with some reflexion on the knowledge of and attitude to hygiene current at the time, will fill in some of the details; Menegaux has described the scene aptly and amusingly.

In the eighteenth century the *Hôtel-Dieu* was ravaged by several fires. In 1718 the *Petit-Pont* was burnt; in 1737 the victims were the buildings on the *Pont-au-Double* side. In 1772 the whole hospital caught fire; the conflagration lasted for several days, and the majority of the patients had to be evacuated to *Notre-Dame*. This was the beginning of a critical period in the hospital's history.

[1] *Presse méd.*, December 25, 1956.

[2] The Tours pound was worth about 10d.

A number of plans for its reconstruction had already been mooted, on account of its excessive size. The disaster of 1772 put the matter back on the agenda. The plan which almost carried the day provided for the replacement of the *Hôtel-Dieu* by two distinct establishments, Saint-Louis and Saint-Anne, both to be enlarged. Louis XVI, in 1787, requested the magistrates and a number of scientists nominated by the Academy of Science to make an investigation and decide what reforms were necessary. The great surgeon Tenon was the moving spirit on this commission. His long report deplored the danger of the *Hôtel-Dieu*, which was insanitary and overcrowded. (On the occasion of his visit, there were 3418 patients and 1219 beds.) Tenon recommended that the hospital should be replaced by four hospitals on the outskirts of the city. The proposal was dropped on account of the revolutionary disturbances of the time. In the meantime, thanks to the provision of subsidies by the city and to private gifts, the *Hôtel-Dieu* had been rebuilt on the old site. In spite of all its disadvantages it was to endure for another hundred years. It retained all its former glory, which it owed to its great age and to the royal protection which it had always enjoyed. The Revolution and the upheaval that followed it made only slight changes in the functioning of the *Hôtel-Dieu*, one of which was the changing of its name to *"Le Grand Hospice d'Humanité"*; but for the present we are considering only the actual hospital buildings, not the dynamics of a great institution. That is for another occasion. Late in the nineteeth century Napoleon III decided to transfer the *Hôtel-Dieu* to its present site. This decision was taken owing to the influence of the Urbanist Haussmann, who did so much to make Paris healthy. The old hospital was a shocking example of overcrowding and lack of hygiene. The new hospital opened its doors in 1878, and during the period of its building, the old hospital was demolished. Its place was taken by the narrow square now dominated by the statue of Charlemagne, which was posed for by Dr. Dumontpellier, of the *Hôtel-Dieu* staff.

INCIPIENT FLUORINE INTOXICATION FROM DRINKING WATER.

THE addition of fluorides to town water supplies has spread considerably over the past few years and much can be said in its favour. At the same time the possibility of the development of fluorosis in persons drinking the water must be considered. G. L. Waldbott[1] has collected data on 52 cases in which he considers people have developed incipient fluorine intoxication from drinking fluoridated water. Chronic fluoride intoxication in animals is well known, and a similar condition has been found in human patients who have absorbed relatively large amounts of fluoride. The major changes are in the bones, joints and teeth, but symptoms due to involvement of other organs are common. These are very varied and affect the gastro-intestinal system, the circulation and respiration and the nervous system; none are very clearly defined.

In the first of Waldbott's cases the patient was examined after three years of drinking water fluoridated to one part per million. He had severe backache, severe abdominal pain, nausea and marked flatulence after drinking water, stomatitis, pain and paræsthesiæ in the arms and legs, extreme exhaustion and mental deterioration. The results of laboratory and X-ray studies were negative. There is close resemblance here to the clinical picture which has been described in association with chronic fluorosis. The symptoms completely disappeared after elimination of fluoridated water and reappeared upon its resumption.

Waldbott's other patients had similar symptoms while drinking the fluoridated water, and the symptoms disappeared when water containing no fluoride was taken. None of the patients showed changes in the bones, ligaments, joints or teeth, but these effects do not develop within less than ten years of drinking water containing much more fluorine than is contained in the artificially fluoridated waters. While there was a complete absence of objective findings, a clear-cut disease pattern could be seen in every case described. So far the evidence that this is due to fluorine poisoning is based on the following facts. There is a close resemblance to published descriptions of industrial poisoning and to chronic fluorosis in animals. Changes in bone, joints and teeth cannot be expected in the incipient stage. There is a parallelism of this condition with acute fluorine poisoning, since mainly the same organs are involved—namely, the muscles of the arms, legs and back, the gastro-intestinal tract and the lower part of the urinary tract. The symptoms cleared after elimination of fluoridated water and recurred in those individuals who resumed its intake.

If these findings are confirmed by other observers, some important points will be raised in connexion with fluoridation of town water supplies. There is a widespread demand for extension of fluoride addition to the water supplies of other towns, but there is also considerable opposition to the use of fluoride. It may well be contended that more evidence is needed before fluoridation is extended. If fluoride in the water at a concentration of one part per million can cause the considerable discomfort described by Waldbott, the good effects that have been reported in the prevention of caries may need to be reappraised.

[1] *Acta med. scandinav.*, December, 1956.

DISSEMINATED SCLEROSIS AND THE FEEDING OF FATTY ACIDS FROM CEREBROSIDES.

SEVERAL WORKERS have claimed that there is a relation between the ingestion of fatty acids and atherosclerosis, coronary disease and other diseases. Lately the interest has been focused on the unsaturated fatty acids from linoleic acid upwards. Not a great deal is known as yet about the role of fat and the constituent variety of fatty acids in human nutrition. This applies particularly to the long chain, unsaturated fatty acids such as eicosenic (C20) and nervonic (C24) acids found in cerebrosides and sphingomyelin of the central nervous system.

It has been reported that feeding a preparation of brain cerebrosides resulted in a lowering of blood cholesterol levels and increased excretion of cholesterol in the fæces. The unusual nature of the fatty acids and the fact that they generally occur only in cerebrosides and sphingomyelin suggested to R. L. Noble, K. K. Carroll and A. S. Douglas that they have some specific role in the metabolism of the nervous system.[1] As these substances and their fatty acids are in the food in very small quantities, the body must be dependent on a synthetic mechanism for their production. The authors cited have treated patients suffering from various neurological disorders with cerebroside preparations in the hope that if the disease resulted from a deficiency of the fatty acids it would respond to replacement therapy. The first patient treated was suffering from advanced Parkinson's disease. No account is given of the result except that the patient showed no untoward effects. Six patients suffering from disseminated sclerosis were given a preparation of fatty acids from beef spinal cord cerebrosides continuously for periods averaging 12·5 months. The patients continued their ordinary mode of life, and the fatty acid preparation was given by mouth in the food, in an amount approximately equivalent to 20 grammes of spinal cord per day. One of the characteristic features of disseminated sclerosis is the variability of its course. During the period of observation no spectacular improvement has been noted, but none of the patients experienced a major exacerbation of the process. One would not expect that the treatment would affect lesions already existing. The authors state that the results presented raise the possibility that the maintenance

[1] *Canad. M. A. J.*, January 1, 1957.

and function of the myelin sheath of nerves may be dependent on the specific nature of the fatty acid components of the cerebrosides which it contains. No definite conclusions can be drawn from the experiments to date, but further investigation seems worth while.

ENDOMETRIOSIS OF LUNG.

The term vicarious menstruation is of common usage, and implies bleeding from any place other than the uterus, usually of a recurrent nature and reminiscent of menstruation. This phenomenon has been recorded many times from the upper respiratory tract, and has frequently been ascribed to endometriosis although visual proof has been lacking. R. Lattes *et alii*[1] describe a case of pulmonary endometriosis which is extremely rare, and may in fact be unique as there is no similar report in the literature. A medical technician in a tuberculosis sanatorium had always had good health, and the only significant item in her medical history was a dilatation and curettage for menorrhagia. She had a sudden brisk hæmoptysis, which was repeated subsequently three times in four months. Although she had no symptoms she was admitted to hospital for investigation, but no tuberculosis, histoplasmosis or coccidioidomycosis was found. The hæmoptyses continued, but now were usually associated with her menses; a diagnosis of pulmonary endometriosis was suggested. Androgens were prescribed, and the hæmoptyses ceased.

The patient later became pregnant, and threatened to abort after three months' gestation. The threatened abortion was accompanied by thoracic pain and pleurisy, and X-ray examination showed a coin lesion in the middle lobe of the right lung. At thoracotomy a circumscribed, tan, translucent tumour was found. This tumour on section was considered to be an endometrioma.

Microscopical lesions in the lung consisting of what was considered to be decidual tissue have been found on three previous occasions (one by P. H. Hartz,[2] two by W. W. Park, quoted by Hartz), and pleural lesions twice (by H. Nicholson[3]). The occasions when decidual matter has been found in the lung have all been after delivery, and together with the present case, provide evidence for the hæmatogenous spread of endometrial emboli. This has always been regarded as rare in human beings; and it certainly seems that, as it may well happen frequently during manipulative activities, the emboli are rarely if ever viable. Although local spread or metaplasia in cœlomic rests may be an adequate explanation for intraperitoneal endometriosis, embolism may well prove a more acceptable explanation for more distant occurrences.

UROPEPSINOGEN IN DIAGNOSIS.

That pepsinogen occurs in human urine has long been known, and there has been much discussion as to the clinical value of its determination. W. P. Peak, E. Viergiver, E. J. Vanloon and G. G. Duncan have made a critical survey of methods for its determination and its relation to disease processes.[4] The method of their choice for estimation is a simple one. The urine is collected in bottles containing 0·5 cubic centimetre of sulphuric acid (25%). Pepsinogen is converted into pepsin by incubating a portion of the sample for one hour at 37° C. with 2N hydrochloric acid at pH 2·5 to 3·0. Buffered casein solution is added to an aliquot of the activated urine, and the time taken for the pepsin to flocculate casein particles is observed. Determinations are made with solutions of crystalline pepsin treated in the same way, and a graph is made from which urine values are calculated.

The method was shown to be particularly useful in the diagnosis of duodenal ulcer and pernicious anæmia. Of the patients with duodenal ulcer, 92% had higher values than the highest normal. In patients with gastric ulcer the pepsinogen values fell within the normal range, and these were considerably reduced after subtotal gastrectomy. In patients with gastric malignant disease the values were much lower than in patients with benign ulcers. Peak *et alii* state that if a patient has a normal uropepsinogen level, it can be unequivocably stated that he does not have pernicious anæmia, whatever other types of examination suggest. In patients with proved pernicious anæmia the levels of uropepsinogen were extremely low; the lowest normal value was approximately 14 times that of the highest value for patients with pernicious anæmia. There was evidence that the test might be useful in relation to adreno-cortical dysfunction, but more investigation is necessary.

Work by previous investigators has established that the source of uropepsinogen is the stomach, the proportion of pepsinogen passing into the blood-stream to that passing into the stomach being 1:99.

[1] *Surg., Gynec. and Obst.*, November, 1956.
[2] *Am. J. Clin. Path.*, January, 1956.
[3] *Thorax*, March, 1951.
[4] *J.A.M.A.*, December 15, 1956.

THE SEXUAL, MARITAL AND FAMILY RELATIONSHIPS OF THE ENGLISH WOMAN.

Eustace Chesser, in collaboration with Joan Maizels, Leonard Jones and Brian Emmett, has conducted an inquiry into the sexual, marital and family relationships of the English woman.[1] The objects of the inquiry were to discover from samples of English women, both married and single, their views and experiences of marriage and sex, and to relate these to various aspects of their upbringing and home conditions. The inquiry was carried out by means of *questionnaires* distributed by a number of cooperating general practitioners to a cross-section of their women patients; the total number of *questionnaires* completed and returned was 6034. It was hoped that this sample would be representative of the whole adult female population. However, analysis and comparison of the results showed some bias to be present; single women were somewhat over-represented, as were those in the higher occupational, educational and income groups. That some bias should have occurred is, perhaps, only to be expected in view of difficulties inherent in this kind of research. Though rendering the findings somewhat less comprehensive, such a bias does not necessarily detract from their interest.

So far as new facts are concerned, those relating to the incidence of pre-marital intercourse and the complex variety of factors governing this are of the most interest. In this respect, the inquiry most resembles that undertaken by Kinsey, with which it inevitably excites comparison. Apart from this there is no close similarity. Although nothing very new or startling emerges, those findings uncovered are satisfactory, as they appear to provide sound confirmation of certain ideas long cherished by many psychiatrists, psychologists and sociologists. The relation between satisfactory upbringing and the ability to achieve in the course of time a happy and stable marital relationship is clearly demonstrated, as is the close association between the quality of parent-child relationships and happiness in childhood. Similarly, an examination of such questions as the influence of parental control, punishment and sex education, the incidence of pre-marital sexual

[1] "The Sexual, Marital and Family Relationships of the English Woman", by Dr. Eustace Chesser, in collaboration with Joan Maizels, Leonard Jones, B.Sc., Ph.D., Brian Emmett, B.Sc., and with the assistance of Professor F. A. E. Crew, F.R.S., Professor Alexander Kennedy, M.D., D.P.M., Kenneth Walker, M.A., M.D., F.R.C.S., I.C.S., Doris Odlum, M.A., M.D., M.R.C.S., I.C.S., D.P.M., and Canon Hugh Warner, M.A.; 1956. London: Hutchinson's Medical Publications, Limited. 9¼" × 6¼", pp. 680, with many tables and charts. Price: 75s.

intercourse, the happiness of marriage and sexual satisfaction in marriage clearly reveals the all-pervading influence of parental relationships. The influence of religion, though investigated, has proved less easy to determine. While other definite conclusions cannot be drawn, the steady decline in the amount and strictness of religious teaching received and in the strength of the religious background is confirmed. In addition to these findings some interesting data are provided regarding the association between marital happiness and pre-marital expectations of various important aspects of marriage. This matter, which deserves closer investigation, clearly points to a need for better preparation for marriage as a prophylactic measure.

Even within its by no means inconsiderable limitations, the work of Chesser and his collaborators is clearly of much value to all who may have to attempt to deal with marital problems or whose chosen interest is in the field of mental health. While it is not difficult to read, the greatest value of this book is probably as a work of reference.

PSYCHIATRIC NURSING.

THE World Health Organization has issued the first report of its Expert Committee on Psychiatric Nursing, which was set up on the recommendation of its Expert Committee on Mental Health. The membership of the committee represents both the medical and the nursing sections of those concerned in psychiatric care, and so the report relates to all aspects of the care of the mentally ill as well as to the specific role of the psychiatric nurse. It traces the steps in the evolution of psychiatric care, from confinement of the patient for the protection of the community to efforts to cure him so that he can resume his place in society. The implications for the psychiatric nurse are shown: in particular, with a shift of emphasis the role of the nurse has become more therapeutic and less custodial. Within the framework of a detailed discussion of the work of the psychiatric nurse, the report goes on to describe all the community mental health services and the nature of psychiatric nursing within them. The nurse's role is considered under three headings: technical, social and interpersonal. The importance of group activities and the idea of a "therapeutic community" within the mental hospital are stressed. Attention is then turned to the education of psychiatric nurses. The learning process in psychiatric nursing is dealt with a some length, and the emotional problems in training for this work are noted. Teaching methods are discussed, and a minimal basic curriculum is outlined.

This is a brief summary of the content of the report. It will doubtless be studied carefully at first hand by those to whom it is of immediate importance, and there is little to be gained by reproducing further details here. However, the conclusions and recommendations of the committee should be of general interest. Consideration of the contribution of the psychiatric nurse to the care of the mentally ill throughout the world raises broad and difficult problems. It was found that each relevant item considered by the committee was related to, or was an extension of, every other factor. The report points out that the role of the psychiatric nurse is always directly affected by the progress in the development of psychiatry, and this in turn is a reflexion of the concurrent cultural concepts regarding mental illness. The education of the psychiatric nurse is altered and extended with the change in her role and new understanding of psychiatry. This has not been a steadily evolving process, with smooth transitions for which the profession is prepared. Instead, psychiatric nursing has developed in an uneven, erratic manner, and many gaps have been left in the care of the mentally ill and in programmes of mental health, even in the most highly organized countries. These gaps present many of the central problems in the field today.

The committee has emphasized the vast differences in the developmental level of psychiatric nursing that exist throughout the world. The differences reflect economic, social and cultural factors and therefore should be carefully considered in planning future developments. Support is given to a suggestion, previously put forward by the Expert Committee on Mental Health, that in countries which have few hospital facilities, or none, and in which mental patients are retained in the community, early emphasis might be placed on community services, home care services, and the mental health aspects of maternal and child care, general medical care, industrial health and the like. Rapid advances in the application of psychiatric nursing implied by such programmes can take place only if the tendency to prescribe, or to copy, practices of one country is seasoned by a realistic grasp of the culture and needs of the other, and by a recognition of the fact that no country is without serious current problems.

The committee makes the following specific recommendations: (i) that national health administrations include, among their administrative officers, nurses with responsibility for the over-all planning of nursing service and nursing education, and that this planning include consideration of the nursing needs of mental hospitals and other mental-health programmes; (ii) that fellowships be provided for nurses to prepare them for advanced positions in psychiatric nursing; (iii) that, on request, WHO make available consultant services in psychiatric nursing and research methods; (iv) that an understanding of psychiatric nursing, mental health, and social and preventive aspects of nursing be extended through national and inter-country nursing seminars; (v) that training programmes for psychiatric nurses be developed to a professional standard as rapidly as practicable, following general educational principles such as the careful respect for the learning needs of the students in planning their course of study and clinical work, with nurses teaching the nursing aspects, and other modern educational practices; (vi) that facilities be provided for psychiatric nursing students to be taught in their native tongue, and in any case in a language that is well understood by them; (vii) that programmes of nursing education include the study of mental health and of social and preventive aspects of health, and that these subjects be integrated throughout the curriculum; (viii) that in relation to further studies in psychiatric nursing: (*a*) administrative personnel in national and local positions encourage and facilitate studies on the subjects indicated in section 4 of the report; (*b*) participation of nurses in research pertaining to psychiatric nursing, and inclusion of nursing with other disciplines in psychiatric research, be stimulated and encouraged; (*c*) advanced programmes of study for psychiatric nursing include research methods; (*d*) WHO stimulate and coordinate studies in these fields. Emphasis is laid by the committee on the fact that this report represents only the beginning of a basis for identification and solution of problems in this field. It will be appreciated also that the question is being viewed from a world point of view, and that certain of the recommendations relate to the problems of particular countries or groups of countries. In the light of this, the work of the committee has been constructive, and much good should come from its further deliberations.

HALF-YEARLY INDEX TO "THE MEDICAL JOURNAL OF AUSTRALIA".

THE index to THE MEDICAL JOURNAL OF AUSTRALIA for the half-year ended December 31, 1956, is now available. A copy of the index is sent to all libraries, medical societies and associations receiving THE MEDICAL JOURNAL OF AUSTRALIA, as well as to journals having exchange arrangements with the journal. Readers who have previously asked to have their names placed on the index mailing list will receive their copies as usual. Other readers who wish to receive a copy are invited to write to the Manager, The Printing House, Seamer Street, Glebe, New South Wales.

Abstracts from Medical Literature.

OPHTHALMOLOGY.

Vasopressin and Intraocular Pressure.

B. Becker and R. E. Christensen (*Arch. Ophth.*, July, 1956) have studied the effect of local administration of vasopressin to one eye of each of 75 patients; 53 of the patients were glaucomatous. It was found that intraocular pressure was lowered in all the eyes tested, both normal and glaucomatous. The duration of the depression of intraocular pressure was not more than four hours. Repeated tonograms before and after administration of vasopressin revealed that the fall in intraocular pressure was not associated with increased facility of aqueous outflow; vasopressin decreases aqueous production. The effect of vasopressin was greater in untreated eyes, but the usefulness of vasopressin in treatment is limited by the fact that the eye rapidly develops a resistance to its action.

Retinal Vasculitis with Intraocular Hæmorrhage.

S. J. Kimura *et alii* (*Arch. Ophth.*, September, 1956) review the subject of intraocular hæmorrhage in young adults. The ætiology of the disease is not definite; tuberculosis, *thromboangiitis obliterans*, focal infection and congenital abnormality of the retinal vessels have been mentioned as causes. The authors classify the disease as (*a*) primary retinal vasculitis, which is commonly described as spontaneous hæmorrhage into the vitreous in young adults in which the lesion involves the peripheral veins; (*b*) secondary retinal vasculitis, in which the primary focus of the disease is in the ciliary body; and (*c*) post-choroiditic retinal vasculitis, a form which follows choroiditis. Primary retinal vasculitis is to be distinguished from peripheral choroiditis, Coats's disease, von Hippel's disease, diabetic retinopathy and central vein thrombosis. Secondary retinal vasculitis is to be distinguished from choroiditis and pulseless disease. For treatment the authors recommend antituberculosis therapy and improving the general health of the patient. For the ocular lesion irradiation and diathermy have been tried. For secondary retinal vasculitis treatment of cyclitis is most important. An investigation of 21 patients failed to reveal any abnormality in the blood.

Contact Lenses and Keratoconus.

F. Ridley (*Brit. J. Ophth.*, May, 1956) reviews 92 cases of keratoconus in patients referred for fitting of contact lenses as an alternative to surgery. Of the 92 patients, 83 were found suitable for a trial with contact lenses. The author states that without exception any patient with keratoconus in which there is a red reflex should be tried out with contact lenses, and any patient who can count fingers at one foot with glasses should be given a trial. There is some evidence that the wearing of a contact lens arrests or greatly reduces the rate of progress of the disease. The author recommends that even with a visual acuity of 6/6 in one eye, both eyes should be fitted with contact lenses and they should be worn up to the age of thirty years, when the disease seems to have burnt itself out. Allergy and light-sensitive skin tend to reduce the wearing time of the lens. The results in the series treated were gratifying in respect of the improvement in visual acuity and the tolerance of the lens.

Galvano-Cautery Puncture for Glaucoma.

R. Colley (*Brit. J. Ophth.*, July, 1956) reports on the results of the use of galvano-cautery puncture for glaucoma. He has performed 121 operations on 104 eyes. The types of glaucoma were chronic simple (54 operations), acute (34 operations) and secondary (33 operations). There were three failures in the chronic simple cases and two failures in the acute series; in the secondary glaucoma series the results were bad. The chief advantage of the operation is the speed with which it can be performed. The author considers that the operation is well worth a trial for chronic simple glaucoma and acute glaucoma.

Cyclogoniotomy.

O. Barkan (*Am. J. Ophth.*, July, 1956) describes an operation for glaucoma in which, after deepening of the anterior chamber, an incision at the root of the iris, posterior to the scleral spur, separates the ciliary body from its attachment and creates a communication between the anterior chamber and the suprachoroidal space and so reduces intraocular pressure. He describes the technique in order to encourage a more extensive trial of the procedure.

Observations on Herpetic Keratitis and Keratoconjunctivitis.

P. Thygeson *et alii* (*Arch. Ophth.*, September, 1956) lay down diagnostic criteria which must be fulfilled if a lesion is to be regarded as herpetic. The lesion must be dendritic in form and due to the *herpes simplex* virus. There must be loss of corneal sensation, and as a rule there will be no photophobia. Thirdly, there will frequently be a herpetic lesion on the eyelids, face and lips. Laboratory diagnosis includes virus isolation, cytological diagnosis and serological diagnosis. The authors analyse 200 cases, nine of which were primary and the remainder secondary. In the nine primary cases all lesions healed without resort to cauterizing the cornea. The secondary cases were either superficial or deep; the latter caused deep stromal involvement and were classified as disciform. A trigger mechanism was found in most cases. Fever was the commonest trigger mechanism. Trauma was the cause in 20 cases. Sunburn was the exciting agent in four, and emotional crisis accounted for six. The use of the steroids was the cause in nine cases. With respect to trauma as an exciting cause, the authors state that this should be accepted only when the trauma preceded the onset of the keratitis by several days, corresponding to the incubation period of the disease. The only treatment of value is the destruction of the virus in the epithelial cells by curettage or chemical cauterization, and this is useful only in the superficial form of the disease. In disciform lesions such treatment may do harm. Treatment should be directed towards prophylaxis, especially the prevention of rises in temperature in patients who have had dendritic keratitis. Lamellar keratoplasty has been particularly useful in recurrent attacks.

Continuous Edge-to-Edge Suture in Full Thickness Corneal Graft.

J. I. Barraquer Moner (*Arch. Ophth.*, September, 1956) recommends a continuous suture in full thickness keratoplasty in order to reduce ocular discomfort. In addition to this continuous suture, edge-to-edge sutures are placed at the twelve, three, six and nine o'clock positions. The number of stitches can be equal to, and even greater than, that in the discontinuous suture, even reaching 25 in a seven-millimetre graft. Sharp needles with the cutting edge at the convexity are used, and the needle is of four, five or seven millimetres. The continuous suture is removed on the tenth to twentieth day, every third loop being cut. The author also recommends that at the time of operation a retrobulbar anæsthetic be used, containing alcohol to give a concentration of 10% to 20% in order to reduce irritative reactions caused by the stitches.

Malignant Melanoma of the Choroid.

H. Q. Kirk and R. W. Petty (*Arch. Ophth.*, December, 1956) analyse 228 cases of melanoma of the choroid. Tensions were recorded in 143 cases: the eye tension was found to be soft in 11%, normal in 41% and elevated in 48%; of the 62 glaucomatous eyes with melanomata 92% were found to have the angle of the anterior chamber blocked by peripheral anterior synechiæ. From the authors' findings it appears that glaucoma associated with melanoma is caused by mechanical obstruction by anterior synechiæ secondary to uveitis induced by necrosis of the tumour. There was no evidence to support the theory that glaucoma is caused by either space-occupying encroachment of tumour on the vitreous cavity or by pressure on the vortex veins. Of cases diagnosed as glaucoma with cloudy media, 18 were proved histologically to be associated with a melanoma which was not expected clinically, as were three cases of *phthisis bulbi* and three cases of retinal detachment. Benign melanomata were present in the iris in 42% of the cases with proven melanoma. Finally, 81 eyes which were enucleated because of a clinical suspicion of malignant melanoma were found to have conditions as follows: glaucoma with hazy media in 24 cases; subretinal or choroidal hæmorrhage in 11 cases; Kuhnt-Junius (disciform) degeneration in three cases; Coats's disease in one case; uveitis in 10 cases; endophthalmitis in five cases; serous detachment and glaucoma in eight cases; serous detachment without glaucoma in eight cases; cysts (iris, retinal and cysticercus) in three cases; benign pigment inflammation in three cases; astrocytoma in one case; metastatic

carcinoma in one case; no tumour in three cases.

"Iodo-Niacin" for Hæmorrhages.

I. A. ABRAHAMSON, JUNIOR AND SENIOR (*Am. J. Ophth.*, November, 1956), found in a controlled clinical investigation that "Iodo-Niacin" gave successful results in 22 cases of retinal or vitreous hæmorrhage and 89 cases of vitreous floaters. The tablets contain potassium iodide, 1·35 milligrammes, and niacinamide hydroiodide; the dosage is one tablet three times daily after meals. The length of treatment varied from one to thirteen months. Benefit was visible from eighteen to twenty-eight days after commencement of treatment. No case of severe iodism occurred; but minor ill effects were noted, such as an occasional bad taste in the mouth or pruritus with an acne-like dermatitis. The dermatitis cleared when the daily dosage was reduced from three times a day to once daily.

Ocular Wound Healing with Particular Reference to the Cataract Incision.

J. H. DUNNINGTON (*Arch. Ophth.*, November, 1956) finds that a slowly healing wound, delayed formation of the anterior chamber, leaking aqueous and fistulation of the wound are potential precursors of epithelial invasion of the anterior chamber. His studies have shown that the slough caused by a deeply inserted and tightly tied suture may produce a weakened spot in the wound. If the slough is sufficiently deep or if the suture penetrates into the anterior chamber, aqueous will escape. The iris may become impinged in the wound and delay closure, and thus set the stage for epithelialization. The smooth surface of a silk suture is an ideal track; whereas after the use of chromicized surgical gut the epithelium does not manifest the same invasive quality, because in the process of disintegration the gut swells and becomes rough.

OTO-RHINO-LARYNGOLOGY.

Laryngoœsophagectomy.

M. L. SOM (*Arch. Otolaryng.*, May, 1956) states that carcinoma of the post-cricoid region is best treated by surgical extirpation. Lateral pharyngotomy with preservation of the larynx is a limited operation with disappointing results. Radical excision of a segment of the pharynx and upper part of the œsophagus, together with the larynx, is more favoured today. Reconstruction of the pharynx may require extensive plastic repair, often after a prolonged pharyngostomy. Whereas in most instances of carcinoma of the hypopharynx the cricoid and the posterior wall of the larynx are involved, the anterior portion of the larynx is nevertheless free of disease. It would thus seem possible to preserve the anterior half of the larynx in the great majority of cases. Similarly the anterior portion of the upper part of the trachea could be retained after wide excision of the malignant tumour in continuity with the posterior portion. These semi-circular cartilaginous structures and the lining mucosa may be used to form the anterior half of the newly-to-be-constructed œsophagus. The posterior half may be supplied by a split-skin graft resting on the prevertebral fascia and sutured to the margin of the laryngeal remains laterally. A case of successful use of such a procedure is reported. After exposure of the larynx through a "U"-shaped incision, upward reflection of the apron of skin and division of the pre-laryngeal strap muscles, the thyroid alæ are freed along the posterior border on each side, and the cartilage is separated from the underlying soft tissues by dissection and removed. Care is taken not to disturb either the superior laryngeal vessels or the inferior thyroid arteries. The thyroid gland is divided, sutured and displaced laterally. The trachea is divided between the fourth and fifth tracheal rings and the œsophagus severed about two centimetres below the palpable lower edge of the tumour. The upper segment of the trachea is bisected into anterior and posterior halves by two vertical incisions through the mid-point of its lateral walls. These incisions are continued upwards through the cricoid, and thence through the vocal cords and thyro-hyoid membrane to enter the pyriform sinus. The upper extent of the neoplasm can now be seen. A transverse incision is now made in the wall of the pharynx about two centimetres proximal to the upper tumour edge. The tumour now may be separated from the pre-vertebral fascia and delivered *en masse* with the posterior segments of the trachea and larynx and complete circumference of the involved segment of the hypo-pharynx and upper part of the œsophagus. Above and below, the mucosal surfaces of the remains of the larynx and upper part of the trachea are sutured to adjacent mucosal edges of the anterior parts of the severed pharynx and œsophagus. A flattened hollow Negus tube is introduced along the anterior wall of the newly created pharyngo-œsophagus and into the lumen of the distal end of the œsophagus. This tube forms a mould to bridge the gap extending from the base of the tongue to the transected œsophagus. A Thiersch skin graft is spread out on the prevertebral fascia between the transected pharyngeal and œsophageal openings and is sutured to the posterior margins of the severed mucosa above and below. The skin is then wrapped round the mould, and its edges are sutured anteriorly to the posterior margins of the laryngo-tracheal autograft, thus completing the new pharyngo-œsophagus. Feeding by œsophageal tube is continued for about eighteen days. The mould is extracted after about three weeks. Healing was complete and without any leakage in the case reported.

Choanal Atresia.

R. POCH-VINALS AND R. R. CALVO (*Arch. Otolaryng.*, June, 1956) state that if the possibility of choanal atresia were considered by the obstetrician and pædiatrician, many of the cases diagnosed as neo-natal asphyxia would be correctly attributed to atresia, which when bilateral may be incompatible with life. In unilateral cases relatives may notice failure to breathe through one side. The authors report a case in a twelve-year-old girl. A purulent mucoid discharge was noticed on the affected side. Obstruction of the posterior choana on one side was confirmed by probing, by post-nasal examination and by X-ray examination after filling the nasal cavity with "Lipiodol". The septum was deviated from before backwards towards the occluded side. The nasal sinuses were symmetrical and normal. The mastoids and the hearing were normal. The authors, in describing treatment, state that surgical measures are necessary to open the choana. The avenues for approach may be transnasal, trans-septal, transantral and transpalatine. The transpalatine approach is made through a "U"-shaped incision commencing inside the second molar and following closely around the inner alveolus to the opposite second molar. The flap of mucoperiosteum is reflected backwards and includes the vascular pedicle of each side. Once the detachment reaches the posterior edge of the hard palate, the bone is partially removed towards the pterygoid bone, which may be partially removed with the electric burr. Mesially the removal of bone exposes the inferior-posterior border of the vomer. The choanal obstruction is next able to be removed along with the posterior border of the septum. The elevated septal mucosa is used to wrap around the edge of the new choanal opening and is retained in position with a thick drainage tube for forty-eight hours. The palatal flap is sutured back into position. The advantage of this approach is the provision of direct vision. Permanency of the window is made possible by the removal of bone from the septum, hard palate and pterygoid, and by the use of a flap of mucosa which is manipulated to cover the raw surface. The method permits intervention at a very early age and does not appear to interfere with subsequent development of the nasal fossa.

Fenestra Ovalis for Otosclerotic Deafness.

S. ROSEN (*Arch. Otolaryng.*, September, 1956) considers that when the bony otosclerotic mass causes extreme fixation of the footplate, pressure against the stapedial neck may not mobilize the footplate but may instead fracture the crura. For such cases a further development of the mobilization technique was devised by applying the mobilizing force directly to the footplate itself. This is called the "direct" method of mobilization. In this the sharp-pointed explorer is used to exert the necessary pressure against various sites along the peripheral margin of the fixed footplate, in order to pry it loose. By this method the hearing has been restored to the same high levels as by the indirect method. Another technique suggested is that of making a fenestra through the inferior peripheral margin of the stapes footplate into the oval window itself or through the footplate itself. In many cases the hearing has been restored to the same high levels as those achieved by the indirect or direct mobilization techniques. In the first series of cases the *fenestra ovalis* was made after the crura had been fractured in unsuccessful attempts at mobilization. In a further series the crura remained intact, but mobilization failed. A substantial hearing improvement was obtained in all ten cases, after the *fenestra ovalis* had been made to obviate the previous difficulties.

Congresses.

THE AUSTRALIAN AND NEW ZEALAND ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE thirty-second meeting of the Australian and New Zealand Association for the Advancement of Science was held in Dunedin from January 16 to 23, 1957, under the presidency of PROFESSOR SIR MACFARLANE BURNET, M.D., Ph.D., Sc.D., D.Sc., F.R.S., F.A.A., F.R.C.P., F.R.A.C.P.

THE SECTIONS.

The Sections represented were: A, Astronomy, Mathematics and Physics (including Optometry); B, Chemistry; C, Geology; D, Zoology; E, History; F, Anthropology; G, Economics, Statistics and Social Science; H, Engineering and Architecture; I, Microbiology, Epidemiology and Preventive Medicine (including Nutrition Subsection); J, Education, Psychology and Philosophy; K, Agriculture and Forestry; L, Veterinary Science; M, Botany; N, Physiology and Biochemistry; O, Pharmaceutical Science; P, Geography.

RECEPTIONS.

The Mayor, Sir Leonard Wright, and Councillors of the City of Dunedin held a Civic Reception on Monday night, January 21, and afterwards entertained overseas visitors and their wives at supper.

INAUGURAL MEETING AND PRESIDENTIAL ADDRESS.

The inaugural meeting was held in the Dunedin Town Hall on the evening of Wednesday, January 16, in the presence of the Governor-General of New Zealand, His Excellency Sir Willoughby Norrie, and Lady Norrie. After an academic procession the honorary degree of D.Sc. of the University of New Zealand was conferred upon the President of A.N.Z.A.A.S., Sir Macfarlane Burnet, Sir Theodore Rigg, a Past President of A.N.Z.A.A.S., and Mr. L. J. Wild. SIR MACFARLANE BURNET then delivered his presidential address, "Biology and Medicine" (see page 405).

PUBLIC LECTURES.

On the evening of Thursday, January 17, two public lectures were delivered, one by DR. D. DENNY-BROWN (Professor of Neurology, Harvard University Medical School) and one by PROFESSOR RAYMOND FIRTH (Professor of Social Anthropology, London School of Economics and Political Science).

Dr. Denny-Brown spoke on "The Impact of Science on Neurological Medicine" and Professor Firth discussed "Social Anthropology as Science and Art".

On Friday, January 18, PROFESSOR A. K. MCINTYRE (Professor of Physiology, University of Otago) delivered the David Lecture on "Symbolic Mechanisms in Biology".

On Friday evening there were two public lectures. One was concerned with the International Geophysical Year and Australian participation in it, and discussion was initiated by DR. E. D. ROBERTSON, of the Department of Scientific and Industrial Research, Wellington, and PROFESSOR H. C. WEBSTER, of the University of Queensland.

At the same time PROFESSOR CLARK KERR, Chancellor of the University of California at Berkeley, spoke on "The Labour Problem in Economic Development".

On Tuesday evening DR. CLAUDE E. ZOBELL, of the Scripps Institution of Oceanography, California, gave a public lecture entitled "The Exploration of the Deep Sea".

CHURCH SERVICES.

On Sunday, January 20, a special combined inter-denominational church service was held at St. Paul's Cathedral. The preacher was the Reverend J. G. Matheson, minister of Knox Presbyterian Church. A special Mass was celebrated at St. Joseph's Cathedral.

1958 CONGRESS.

It was agreed that the next meeting of the Australian and New Zealand Association for the Advancement of Science should be held at Adelaide, South Australia, in August, 1958. The President-Elect is PROFESSOR M. L. OLIPHANT.

SECTION F: ANTHROPOLOGY.

DR. J. HAMMET (Melbourne) spoke on adjustment problems of New Australians. He pointed out that acculturation depended on restoration of social communication and restoration of capacity to form new relationships. Not only must the social differences be eliminated and the culture distance reduced, but also emotionally the migrant must be sufficiently mature to understand and absorb the outward content of a new pattern, as well as to feel according to the tacitly agreed-upon content of the new pattern.

Discussion of selected problems of acculturation included the learning of a new language, of new patterns of total speech behaviour, including speech melody, and of cultural patterns associated with social intercourse. The learning of a new language was intricately bound with the learning of new cultural patterns.

An illustration of the learning of new patterns was given from a recent study by Dr. Hammet of social behaviour of migrant mothers of infants attending Victorian infant welfare centres. The figures were assembled for British and non-British (Continental) migrant mothers from 86 infant centres for the period 1948 to 1953 in metropolitan, mixed and country areas. Observations pointed to the fact that adjustment of New Australians at an early stage of acculturation took the form of double life twofold adaptation. Certain patterns were retained which were congruous with the old culture and to which a migrant was very much attached. Certain other patterns to which a migrant was less attached, or which were less congruous with the old culture, were abandoned gradually and new patterns, in their entirety or with modification, were adopted. Thus a compromise was reached by which most of the old values were still retained and some new values were incorporated.

Acceptance of the necessity to abandon gradually the familiar old values depended on acceptance by the new community of social advancement for the migrant. Without the reward of social advancement, encouragement for acculturation would be lacking. In answer to the question of why social advancement for migrant and plurality of patterns were so difficult to achieve, Dr. Hammet said that it was because the field of tension showed that both sides, the receiving community and the migrant, were suffering from insecurity.

SECTION I: MICROBIOLOGY, EPIDEMIOLOGY AND PREVENTIVE MEDICINE.

In his presidential address to the Section of Microbiology, Epidemiology and Preventive Medicine, PROFESSOR F. J. FENNER (Canberra) discussed myxomatosis in the Australian wild rabbit as an example of the evolution of viral diseases. He said that although the virus caused only a benign tumour-producing infection in the native rabbits of Brazil, virus recovered directly from such rabbits caused a very severe, almost uniformly fatal disease in European rabbits. The use of myxoma virus for the control of European rabbits in Australia presented a unique opportunity to observe the changes in host and parasite which occurred when a very lethal "new" virus was introduced into a numerous and highly susceptible rabbit population.

The initial summer outbreaks were associated with very high case-mortality rates, figures of over 99% being normal. Within a year, however, the case mortality rate had fallen to 90% in areas where a second spontaneous outbreak had occurred. Professor Fenner proceeded to describe investigations into the cause of this fall in the mortality rate. He said that immunological factors had proved to be unimportant, and the initial fall was shown to be due almost entirely to a change in the virulence of the virus. Transmission in Australia was due almost entirely to mechanical carriage by mosquitoes. It appeared that the very virulent strain of virus killed rabbits so rapidly that it could not compete successfully with a variant strain which produced a disease with a mortality rate of 90%. The less virulent virus produced numerous highly infectious skin lesions, and many rabbits survived for a prolonged period in a highly infectious condition.

The variation in virus virulence was discovered by testing virus preparations derived from field cases in laboratory rabbits from colonies which had never been exposed to myxomatosis. The reverse procedure was also carried out—namely, the investigation of the resistance of wild rabbits whose parents had been exposed for different periods to the selective effect of myxomatosis. A stock of a virus strain of moderate virulence, sufficient for tests carried out over several years, was prepared and stored in dry ice. With this material wild rabbits, which had been captured as

spring kittens in the field in areas of known myxomatosis history, were tested to see if their innate resistance increased with increasing selection due to epidemics of myxomatosis. A slight but steady increase in resistance was observed in one locality over the first three years of observation, and a somewhat greater increase in resistance after a further year. The findings of the experiments, which were continuing, suggested that under the selective pressure of severe outbreaks of myxomatosis there was a relatively rapid increase in the genetic resistance of the host animals.

Professor Fenner concluded by comparing the situation in myxomatosis with what might have occurred in other generalized viral infections.

Virology.

Latent Infection with Psittacosis Virus.

Parrots infected with psittacosis virus as fledglings usually carry the virus in a latent form for the rest of their lives, and recently cases of latent or recurrently active infection of man with psittacosis virus have been described. In parrots the infection often changes from a latent to a clinical state when the birds are overcrowded, as in pet shops. In an effort to determine the nature of this change from latent to clinically apparent infection, MR. F. J. AUSTIN (Dunedin) has induced a latent infection with psittacosis virus in mice by infecting them with a large dose of the virus, and two days later administering one milligramme of "Aureomycin". About 60% of the mice so treated became healthy carriers.

The carrier mice were subjected to a large variety of physiological disturbances, including the administration of insulin, adrenaline, mucin, dinitrophenol and cortisone, as well as subjection to cold and to prolonged physical exertion. None of these measures activated the virus except the subcutaneous injection of 10 milligrammes of cortisone. In many carrier mice inoculated with cortisone signs of psittacosis infection became apparent about a week later, and such mice often died, showing typical post-mortem signs of psittacosis. The mechanism by which cortisone caused activation of the infection was not discovered. There was no significant change in the level of complement-fixing antibody.

Chemotherapy of Virus Diseases.

DR. R. E. F. MATTHEWS (Auckland) discussed the chemotherapy of virus diseases. He pointed out that during the last twenty-five years spectacular advances had been made in the control by chemical means of diseases caused by cellular pathogens such as bacteria. In contrast there had been very little progress towards obtaining chemical control of diseases due to viruses. The lymphogranuloma-psittacosis group of virus-like agents, which were often classed with bacteria, were susceptible to treatment by certain antibiotics and other compounds. If that group was excluded, there was no example at present of practical control by chemical means of diseases due to viruses either in plants or in animals. The multiplication of viruses was intimately dependent on the activity of their hosts. Thus, any substance which interfered effectively with virus multiplication was very likely to damage the host tissues as well.

Many thousands of compounds had been tested, particularly against animal viruses. While none had proved effective in a practical way, there were many examples of substances which reduced or inhibited virus growth in tissue cultures or other experimental systems. Such compounds were found among amino acid and vitamin analogues, dyestuffs, acridines, antibiotics, plant growth regulators and many other groups.

Present knowledge of virus multiplication was insufficient to predict with any confidence which classes of compound might be effective. However, in view of the importance of nucleic acids in virus multiplication several workers had studied the effects on viruses of analogues of the purine and pyrimidine bases. Certain of those compounds (for example, 8-azapurines and 5-halogenated uracils) inhibited multiplication of plant and bacterial viruses. From the nucleic acid of viruses grown on hosts treated with those compounds it had been possible to isolate the analogue. A proportion of such virus particles, in which some of the normal base was replaced by an analogue, was incapable of initiating new infections. Thus, with those compounds there was some idea of how the inhibition occurred. It might be possible to use the information in developing more effective inhibitors.

Immunity to Poliomyelitis in New Zealand.

PROFESSOR J. E. CAUGHEY (Dunedin) discussed various methods of assessment of immunity of a population to poliomyelitis, and described the application of the methods to New Zealand, thus providing a background for the application of mass vaccination schemes. He said that immunity could be gauged by study of the incidence of clinical poliomyelitis and the distribution among various age groups. Immunity could be indirectly assessed by taking an arbitrary measure of the standard of hygiene and sanitation, such as the infant mortality rate, and plotting it against the incidence of clinical poliomyelitis. Finally, immunity could now be gauged directly by study of antibody levels to the three types of poliomyelitis virus.

Professor Caughey went on to say that studies of these aspects of immunity had been made in New Zealand among cross-sections of the white population and the Maori population, and these were compared. It was apparent that New Zealand was a country with a very high incidence of clinical poliomyelitis and with low protection against the three types of virus up to the age of thirty years. Thus a mass vaccination scheme was justified in New Zealand.

Mouse Ascites Tumours.

DR. P. WARNER (Adelaide) discussed various aspects of the development of transplantable mouse ascites tumours. They were the tumours that, after intraperitoneal inoculation, caused the accumulation of fluid containing cancer cells in, usually, a monodisperse suspension.

A prevalent suggestion was that the tumour cells multiplied while freely suspended in peritoneal fluid in a manner analogous to that of a bacterial culture. However, from work with the Sarcoma 37 ascites tumour, Dr. Warner presented evidence that the probable sequence of events was that, after inoculation, tumour cells settled in fatty tissue close to blood vessels from which they obtained nutriment for multiplication. The tumour growth occurring at that site interfered with the blood vessels constituting the radicles of the portal system, causing peripancreatic œdema. The œdema fluid passed into the peritoneal cavity, producing the ascites, and the increasing number of cells suspended in it were produced by desquamation from the growth foci within the tissues. That led to the belief that cells of ascites tumours multiplied within tissues and probably not at all in suspension in peritoneal fluid.

In order to throw light on the nature of the growth of ascites tumours, a study was made of the distribution of mice developing tumours after the inoculation of graded doses of Ehrlich ascites tumour cells. The distribution did not fit exponential curves, but could be explained on the assumption that the tolerances of individual mice were normally distributed. Hence that tumour could not accurately be described as autonomous; the occurrence of tumours depended not only on the number of cells inoculated but also on the resistance of individual mice.

The same investigation indicated that methods of assay of tumour cells based on the proportion of mice developing tumours after inoculation with dilutions of cell suspensions were probably impracticable. However, it was shown that the survival time of mice was proportional to the logarithm of the number of cells inoculated, and that it was possible to apply the slope-ratio method of assay to the Ehrlich ascites tumour.

The Murray Valley encephalitis virus was serially passaged in mice bearing the Ehrlich ascites tumour. During the first nine passages the negative log ID_{50} of the virus varied from 3·5 to 5·3, and ascites was produced as expected. From the tenth passage onwards the virus titre rose to more than 8·6, ascites production was inhibited, and there was evidence of oncolysis.

Zoonoses.

As at the Canberra meeting of the Australian and New Zealand Association for the Advancement of Science in 1953, a conjoint session was held by Section I and Section L (Veterinary Science) on "Animal Diseases Transmissible to Man". The main groups of microorganisms discussed were the brucellæ and leptospiræ.

Brucellosis.

DR. M. M. WILSON (Melbourne) reviewed the observations on brucellosis made at the Public Health Laboratory in the University of Melbourne. He said that human brucellosis had been a notifiable disease in Victoria since 1937; from that date the number of reported cases had risen rather irregularly from one to about twenty per year. The diagnosis of the disease was not really satisfactory, since isolation of the organism was the exception rather than the rule, and one was forced to rely on serological findings

allied to clinical data. The clinical picture was extremely variable, and it was likely that cases were often missed; brucellosis exemplified the dictum, "you only find what you look for". Records in the Public Health Laboratory in the University of Melbourne, which served the whole State of Victoria, suggested that some medical practitioners were more brucellosis-conscious than others; hence the notifications probably fell far short of the actual number of cases occurring, and the steady rise since 1937 might be partly due to this brucellosis-consciousness.

From 1950 to 1955, inclusive, notifications in all States revealed that Victoria accounted for rather more than half the cases reported in Australia, and that in all States, except South Australia, fewer cases were reported from the metropolis than from the rest of the State.

Brucella infection in man was almost invariably acquired from animals or animal products; in Victoria it seemed that the organism concerned was the bovine species, *Brucella abortus*. There were no accurate figures on the incidence of contagious abortion in cattle, but there was no doubt that large quantities of infected milk were still being drunk, particularly in country areas; however, few infections seemed to be contracted in that way. The preponderant incidence of brucellosis was among those who actually handled cattle, such as dairy farmers, veterinarians and meat-workers, and that suggested that the spill-over of infection from the bovine reservoir to man was by direct manual contact. There was one other source worth a mention; that was Strain 19, which was sometimes accidentally autoinoculated during its administration to cattle; that attenuated strain could produce clinical brucellosis in man.

From experience in Victoria it was clear that brucellosis deserved consideration in many a clinical problem, and that the antiglobulin test was a useful procedure in support of the standard agglutination test; repeated attempts at culture should also be made.

Leptospirosis.

The epidemiology of human leptospirosis in North Queensland was reviewed by DR. E. H. DERRICK (Brisbane), and the results of serum surveys in New Zealand were reported by DR. JOSLAND, DR. ALLEN, DR. CASHMORE and DR. SCOTT (Wellington).

Dr. Derrick observed that leptospirosis was the commonest indigencus fever in North Queensland. In four years, over 400 cases had been studied. Most came from the high-rainfall coastal strip, which extended from Ingham (18·7° S.) to Cooktown (15·5° S.); where the problem was greatest, the annual rainfall exceeded 90 inches. However, sporadic cases arose in drier regions. Most cases occurred in the wet season (January to April); outbreaks in other months were usually associated with cane-cutting. Cases often appeared about ten days after heavy rain. The vicinity of rivers and creeks and wet low-lying canefields were common sites of infection

All cases except 11 were in males. The ages of the subjects ranged from five years to sixty-eight years. Occupationally, 62% were engaged in sugarcane fields; other groups included schoolboys, timbergetters, scrub clearers, bridge and tramway workers and miners.

The cases were caused by 13 leptospiral serotypes, which belonged to nine serogroups. The commonest serotypes were *australis A, australis B* and "Kremastos", a member of the *hebdomadis* serogroup. The sources from which infections arose were being investigated. With five serotypes the main animal carriers were known, with three there was suggestive evidence, and with five the source had not yet been identified.

The mortality was nil. Two patients developed uræmia and one jaundice. The average duration of fever was five days. The prognosis was much better than formerly in North Queensland, when the average duration was ten days; 16% of patients became jaundiced and 5% died. The improvement was due partly to the greater inclusion of milder cases, but mainly to the introduction of penicillin therapy. Doherty had shown that penicillin was effective if given early and in a dose of 2·5 to 4·0 mega units daily.

Preventive measures included the burning of cane before cutting, encouragement of adequate footwear, drainage of wet fields, and anti-rat campaigns. However, the occurrence of 400 cases was a challenge to find improved methods of prevention.

Dr. Josland and his associates reported that they had surveyed a total of 774 human sera by lysis-agglutination technique. Initially (in September, 1954) five serotype strains, *L. icterohæmorrhagiæ* AB, *L. canicoli, L. australis* A, *L. hyos* and *L. pomona*, were used. In June, 1955, type strains *L. australis* B, *L. sentot, L. autumnalis* AB, *L. grippotyphosa, L. medanensis* and *L. bataviæ* were added to the testing strains, and in April, 1956, *L. javanica, L. sarmin, L. schuffneri, L. benjamin, L. ballum, L. cynopteri, L. djasiman, L. semaranga* and *L. andaman* A were included. One hundred and thirty-six sera were tested against five antigens, 321 against eleven antigens and 317 against twenty antigens. Of those, 642 failed to agglutinate the antigens used at serum dilutions of 1:10 and 1:200. Agglutination lysis at serum dilutions of 1:300 or above was obtained with the antigens shown in Table I.

It was pointed out that the strains were the ones with which agglutination occurred to the highest titre. With the sera used cross-agglutination, generally to a lesser degree, but occasionally to a high degree, occurred with other antigens.

The results of the survey to date confirmed the presence of *L. pomona, L. hyos* and *L. icterohæmorrhagiæ* infection already reported in New Zealand by Kirschner. While the presence of leptospiral types in man in New Zealand, other than the three mentioned, must await isolation and serological identification, the results of the survey reported suggested the possibility of the presence of additional types.

On the laboratory side DR. G. M. RICHARDSON (Wellington) described experiments on the in-vitro cultivation of *Leptospira pomona*. He said that leptospiræ were commonly found to be delicate organisms needing large inocula and as much as 10% of suitable serum for serial culture *in vitro*. Even so, cultures were apt to die out inexplicably. To discover reasons for this behaviour, it had been exaggerated by making cultures in diminishing amounts of serum and with smaller inocula.

The following had been the main findings: (i) Pooled sheep serum (Josland, *J.N.Z. Ass. Bact.*, 1955, 10: 47) supported excellent growth of *Leptospira pomona*. (ii) Customary media might lack adequate amounts of calcium and magnesium salts because of removal of phosphate precipitates and the omission of magnesium in preparing Vervoort-Schuffner base. (iii) If calcium and magnesium were added as a soluble complex with EDTA, there was a further requirement for zinc salts. (iv) Yellow-tinted media became toxic on exposure to sunlight or diffuse daylight. As might be expected, the ultra-violet and blue components of daylight contributed largely to that effect. (v) The serum factor was unstable outside the pH limits 4·5 to 10·0 and was destroyed in thirty minutes at 75° C.

With almost colourless, simple media inoculated under artificial light, cultures had been readily maintained at 30° C. in only 0·5% serum with a weekly 2% inoculum. With a 5% inoculum, cultures in 0·1% serum had each passed the twelfth subculture in two separate series without failure. Evidence of adaptation to a completely serum-free medium was lacking.

DR. S. FAINE (Dunedin) described work carried out at the Sir William Dunn School of Pathology in Oxford on the virulence of leptospiræ. He said that virulent leptospiræ injected intraperitoneally into young guinea-pigs multiplied and produced typical infections, whereas avirulent leptospiræ failed to survive. Leptospiræ grew *in vivo* with an average generation time of 8·3 (5·8 to 11·6) hours, for inocula from 10^3 to 10^8 leptospiræ. The guinea-pigs died when they contained approximately 10^8 to 10^9 leptospiræ, irrespective of the duration of the infection. Since the growth rates for all the inocula were similar, death occurred after an interval which varied with the inoculating dose. There was a constant linear relationship between the survival time of guinea-pigs after intraperitoneal injection and the logarithm of the dose of leptospiræ injected for strains of high virulence (ID_{50} = 2-100 leptospiræ). That relationship correlated with the growth rate *in vivo*.

When guinea-pigs were injected with strains of low virulence (for example, $ID_{50} = 4 \times 10^8$ leptospiræ) the relationship between survival and dose was not linear, because the animals survived long enough for circulating antibody to appear and modify the outcome of the infection. There was no serological difference detectable between the virulent and avirulent strains of *Leptospira icterohæmorrhagiæ* used in this study with classical techniques.

Evidence was presented suggesting that virulence was due to the selection *in vivo* of virulent organisms. The stage to which the infection progressed depended on the relative numbers of virulent and avirulent organisms. The balance between the growth of the virulent organisms and their pathogenic effects on the one hand, and the rate of appearance of antibody assisted by the antigens of avirulent

TABLE I.

Strain.	Five Antigens.		Eleven Antigens.		Twenty Antigens.	
	Sera.	Patients.	Sera.	Patients.	Sera.	Patients.
L. pomona	2	2	12	9	40	28
L. hyos	2	2	8	4	7	2
L. icterohaemorrhagiae AB ..	2	1	3	3	3	2
L. sentot	—	—	9	5	1	1
L. australis B	—	—	2	1	—	—
L. mebanensis	—	—	—	—	9	8
L. autumnalis AB	—	—	1	1	4	3

organisms on the other hand, determined the outcome of the infection. Infection of guinea-pigs with relatively avirulent cultures resulted in a slow disease resembling Weil's disease in man more than the acute disease in guinea-pigs.

A great variation in LD_{50} measurements could be expected in experiments with large doses of relatively avirulent material. Survival after small sublethal doses of very virulent material might be due to the absence of virulent organisms from the inoculum, whereas with large doses of attenuated culture it might be due also to the intervention of antibody.

It was obviously necessary to use many young animals and large inocula, when one was attempting to return culture strains to virulence. Small doses and too few animals might account for many conflicting reports on the practicability of returning cultures to virulence by animal passage.

As bovine leptospirosis was a common infection in many countries, including New Zealand, DR. KIRSCHNER, DR. MAGUIRE and DR. BERTRAND (Dunedin) investigated the anti-leptospiral action of milk. Both virulent and non-virulent strains of leptospira were found to die rapidly in undiluted milk from humans, the cow and the goat, when tests for viability were carried out by animal inoculation. It was stated that the studies had been continued with the use of the electron microscope in order to check the disintegration of leptospira at various intervals after mixture with milk and to compare it with the lytic effect exerted by immune sera and 1% sodium desoxycholate solution. After an interval of forty-five minutes the beginning of the destruction of one of the components of the leptospira (the protoplasmic cylinder) was clearly demonstrated; the effect was much stronger after three hours, and after twelve and forty hours only the resistant second component of the structure of the organisms, the axial filament surrounded by protoplasmic masses, was visible.

In a similar way the organisms were affected by 1% sodium desoxycholate solution.

The effect of lytic antibodies in patients and rabbits' immune sera was quite different. After a short-lasting agglutination the leptospirae were transformed into spheric shining particles, with the loss of the whole structure.

It was concluded that the presence of this antileptospiral agent in cow's milk explained the absence of milk-borne infections in the many countries in which bovine leptospirosis was widely spread.

Toxoplasmosis.

In recent years toxoplasmosis has been found to be a relatively common and usually inapparent infection in human beings, and has also been recovered from a variety of domestic animals. MR. J. H. POPE and DR. E. H. DERRICK described investigations on the occurrence of toxoplasma in marsupials and rodents in Queensland. They stated that in February, 1951, a strain of *Toxoplasma* (B316) was isolated by mouse inoculation from a Brisbane bandicoot (*Thylacis obesulus*), and had since been maintained by intraperitoneal passage in mice. In the earlier passages, it was only slightly pathogenic for mice, rarely producing any sign of illness. At autopsy, the only consistent findings were splenomegaly and a nodular interstitial pneumonitis. Because of their scantiness, toxoplasmas were difficult to demonstrate.

After a mouse was infected, there was a parasitæmic stage lasting three to five months, during which toxoplasmas would be widely distributed by the blood-stream. After that stage, they persisted indefinitely in the brain, and often in heart, lung and voluntary muscle.

After the sixty-fourth passage in September, 1954, the B316 strain gradually increased in virulence, and by the eighty-fifth passage in September, 1955, it killed, usually within five days, all mice inoculated in the routine way. Toxoplasmas became numerous in the peritoneal fluid. Cross-immunity and cross-complement-fixation tests carried out by I. Cook showed the B316 strain to be closely related to the RH strain of Sabin.

Mr. Pope and Dr. Derrick went on to report that toxoplasmas had been isolated from the following animals in Queensland: bandicoot, *Thylacis obesulus*, 17/42; bandicoot, *Perameles nasuta*, 3/7; *Rattus assimilis*, 2/12. Infected bandicoots came from in and near Brisbane and from North Queensland. The ecological significance of the high infection rate in them had not been clarified.

Mice infected with a *Toxoplasma* strain of low virulence formed a model for human infection. In each the course was nearly always asymptomatic; in each a parasitæmic stage was followed by a chronic stage with residual organisms in brain and perhaps other organs. Lesions found in mice resembled those reported in the rare fatal human cases of acquire toxoplasmosis. From analogy with the mice, it was suggested that some cases of non-fatal human pneumonitis might be of toxoplasmic origin.

Venomous Spiders.

DR. S. WIENER (Melbourne) summarized his investigations of the venomous spiders of Australia and New Zealand and antivenenes developed at the Commonwealth Serum Laboratories. He said that investigations had been carried out on the redback spider (*Latrodectus hasseltii*) and the Sydney funnel-web spider (*Atrax robustus*). Venom was obtained by dissecting the venom glands, and in the case of *A. robustus* by milking the spider. The toxicity of those venoms in laboratory animals had been studied. A potent antivenene against the venom of *L. hasseltii* had been prepared by the use of venom adsorbed on aluminium phosphate. That antivenene neutralized the venom of the "Katipo" spider. Antivenenes against other species of *Latrodectus* received from Jugoslavia and South Africa were found to neutralize the venom of *L. hasseltii*.

The Growth Medium and the Cultivation of *Mycobacterium Balnei*.

MISS J. TOLHURST (Melbourne) described the effect of the composition of the growth medium on the cultivation of the acid-fast bacillus *Mycobacterium balnei*, at different temperatures. She said that *Mycobacterium balnei* had been first described in 1951 by Norden and Linell (*Acta tuberc. scandinav.*, Suppl. 33, 1954). It produced granulomatous lesions of the skin in man. It resembled *Mycobacterium ulcerans*, which also caused skin lesions in man, in that lesions were produced at low temperature sites in susceptible animals—for example, in the scrotum and in the skin and subcutaneous tissues of the limbs and tails of mice. Both organisms grew on the egg yolk media used for the cultivation of the tubercle bacillus when the temperature of incubation was 30° C., but not when it was 37° C.

It was well known that some bacteria were susceptible to the toxic effects of minute amounts of unsaturated fatty acids, such as oleic acid, which were contained in various media, and that those effects could be neutralized by the addition of bovine serum albumin or of activated charcoal.

Experiments with *Mycobacterium balnei* had shown that the organism was more susceptible to the action of oleic acid at 37° C. than at 30° C. Certain media containing oleic acid failed to support growth at 37° C. unless very large inocula were used; yet small inocula grew readily at 30° C.

When either serum albumin or activated charcoal was incorporated in those media, small inocula were enabled to grow at 37° C.

Miss Tolhurst went on to say that these observations were in line with the present knowledge of the enhancing effect of temperature on the action of soaps on bacteria. They did not explain the apparent preference of *Mycobacterium balnei* for growth in low-temperature sites in the tissues, but were important because of their general implications. Thus cultural methods of diagnosis sometimes failed—for example, in some cases of subacute bacterial endocarditis and in brucellosis, when the size of the inoculum available might be small. It was suggested that incubation at temperatures below 37° C. and attempts to neutralize the toxic effects of fatty acids in media should be considered in any infection when difficulty in cultivating bacteria was experienced.

The Pattern of Disease in Underdeveloped Communities.

A series of papers dealing with nutritional and other problems were dealt with under the general heading of "The Pattern of Disease in Underdeveloped Communities".

DR. D. D. MCCARTHY (Dunedin) spoke on two topics which had arisen during the course of his work in the Island Dependencies of New Zealand—filariasis and liver enlargement in childhood. He discussed the epidemiology of filariasis in Niue and Aitutaki. He said that filariasis was endemic in all three, but showed wide variations in the degree of intensity. The general incidence appeared to be of less importance than the density of infection as indicated by circulating numbers of microfilariæ. Density of infestation could be related to the time of onset of major clinical manifestations and to the working habits and customs of the various population groups; and when the younger and middle-aged groups were alone considered, it was perhaps a better measure of endemicity than was incidence and a better basis on which to formulate control policies. The main vector was *Aëdes polynesiensis*, a member of the *Scutellaris* group.

Dr. McCarthy said that in 1955 he had begun an investigation into infant mortality in some of the Pacific islands within New Zealand's administration. In underdeveloped countries notification and recording of births and deaths were commonly incomplete and inaccurate. Furthermore, with small population groups the mortality rates had a very wide statistical variation. To produce a more accurate picture of infant mortality, a field method was described which could be used to check official rates and to indicate trends.

In such countries also, where malnutrition was common in early childhood, the infant mortality rate only partially reflected the mortality due to infant malnutrition. Separate rates were described which appeared to indicate the specific periods at which infant mortality was highest. Those neonatal, suckling and weaning mortality rates were used to demonstrate the danger periods and to assist in the formation of appropriate health policies.

In those countries, mortality during the weaning period was thought to be due in the main to a protein deficiency, and some facts were considered relating that to liver enlargement in infants and young children. Some of the criteria of this deficiency and their relationship to hepatomegaly were discussed.

PROFESSOR J. A. R. MILES (Dunedin) examined the significance of antibody surveys in backward peoples. He said that the results of those investigations made it clear that diseases spreading directly from man to man, when they were introduced to such communities, normally infected the vast majority of susceptibles. On the other hand, the regular occurrence of antibodies in a low proportion of the members of such a community usually suggested that the disease concerned was primarily an animal disease and that it did not readily spread directly from man to man.

Even very isolated communities seemed to acquire antibodies to a wide variety of the diseases found in advanced countries, and the absence of evidence of infection with such widespread diseases as poliomyelitis was rare even in remote and isolated communities.

Preventive Medicine and the New Epidemiology.

DR. A. R. SOUTHWOOD (Adelaide) spoke on "Preventive Medicine and the New Epidemiology", illustrating his remarks with graphs relating to the incidence of and mortality from heart disease. The modern development of epidemiology was traced through the work of Creighton, Hamer and John Ryle (whose "Changing Disciplines" provided a splendid summary of current ideas on mental pathology and epidemiology). Dr. Southwood said that for every 100,000 people in Australia (or New Zealand) about 900 died each year, 350 of them from diseases of the heart and blood vessels. Violence accounted for about 50 deaths, including 25 from road accidents; the latter were responsible for more deaths than all the infectious diseases combined.

Turning to the question of atheroma (atherosclerosis), the big problem in the cardio-vascular field, Dr. Southwood discussed the "imbibition" and "encrustation" theories, and the recent work on the relation of fat metabolism (especially the β-lipoproteins) to atheroma. He said that excessive intake of fatty foods, especially those of animal origin, was hazardous. Further research would doubtless clarify the problems. At present little could be done of value beyond advising people to live in calm orderly fashion, avoiding emotional stress and obesity. Atheroma had become a public health problem of primary magnitude and importance.

SECTION I: NUTRITION SUBSECTION.

As at the Canberra and Melbourne meetings of the Australian and New Zealand Association for the Advancement of Science, a subsection of Section I was devoted to the subject of nutrition.

Food Technology and Nutrition.

Two papers were concerned with food technology and nutrition.

MR. VERE-JONES (Wellington) discussed the food technologist's contribution to improved nutritional standards. He said that the food technologist might be defined as one who carried out any processing of a food between its leaving the farm and its being consumed at table. The modern food technologist had great resources placed by science at his disposal, but despite those he did not seem to have done much towards the creation of new foodstuffs, whilst streamlined processing had not always improved existing products. Reasons for that were to be found in the realities of food production set against its background of the extreme conservatism in the eating habits of the public who bought the food. Agriculture, aided by food technology, had continued to supply, at prices people could afford to pay, conventional foodstuffs adequate for the nutritional requirements of the western countries; so there had been little pressure on the public to change its tastes. Unless nutrition was demanded, and, perhaps regrettably, it seldom was, the food technologist could not give it too much weight in his considerations. Despite that the food technologist had, mainly by making a wider selection of food available at reasonable cost, made material contributions to better nutrition.

Probably the most important of those had arisen in the field of food preservation. Many advances had been made in that respect almost solely as the result of the efforts of technologists, probably the greatest single advance being the provision of a safe and adequate milk supply. Much of the work had had application elsewhere in industry, with the development of new techniques such as plate heat exchangers and the thermo-recompression cycle.

A good example of the results which food technology could produce when nutritional considerations were important, indeed vital, was to be found in the study of wartime food supply in Britain. Guided by nutritional experts the food technologist made possible such things as the National Loaf, rose-hip syrup and orange juice concentrates with their high vitamin *C* content, and the increased consumption of milk *per capita*. That permitted an actual increase in nutritional levels despite great difficulties in supply, and greatly assisted in the maintenance of morale.

To keep food beyond its natural shelf life, various techniques had been developed. Meat dehydration was a case in point. Both during and after the war, vacuum plate methods had been investigated, and in New Zealand a new process for dehydrating meat in chunks immersed in a bath of fat under a vacuum had been brought to a small commercial scale. The quality of the reconstituted product was higher than in other processes producing meat chunks, and, though slightly inferior to fresh meat, it was of great interest in applications where the supply of fresh meat protein was difficult. One such was in the polar regions, and some of the meat was being taken on the New Zealand Antarctic Expedition.

It was perhaps suitable at meetings of the Australian and New Zealand Association for the Advancement of Science to consider something of the prospects for the future. With industrial expansion leading to an almost certain increase in living standards in the East, changes must occur there to bring nutritional standards to a reasonable level. Calories presented the first problem, but another and more difficult problem to resolve was protein. In particular protein needs could not be met from present resources, and it was doubtful if animal husbandry, with its characteristic low yields per acre, could be extended to meet the demand. Alternative sources must be considered, and the only apparent ones were yeasts and algæ. To make products from those palatable and attractive might be the greatest task ever to confront the food technologist.

DR. F. H. MCDOWALL described recent improvements in the processing and utilization of dried milk. He said that dried milk had been an article of commerce for some fifty years, but there was still room for improvement in the methods of processing to provide a product to suit the users' requirements.

Whole milk powder of excellent quality in the fresh state could be made from good quality milk, but the quality was not maintained over a long storage period, and especially at high temperatures. The following were recent improvements designed to improve the keeping quality: (i) Packing in nitrogen gas, to prevent oxidation of the fat and the development of tallowy flavours; that, however, did not retard the development of the so-called gluey flavour. (ii) Preheating to a high temperature before drying, to increase the antioxidant effect of the milk solids other than fat. (iii) Processing to give a product of low moisture content. (iv) Care throughout that the milk did not come into contact with prooxidative metals, such as copper. (v) Separation of the cream from the milk and concentration of the skim milk before adding the cream prior to drying. (vi) Attempts to find a suitable antioxidant to add to the milk before drying in order to increase the storage life of the powder. Despite all those factors, the storage life of whole milk powder was still not adequate to render the powder an acceptable substitute for fresh milk when allowanse must be made for poor conditions of storage—for example, for army use.

Skim milk powder had a much better storage life than whole milk powder. For preparation of a milk to replace fresh milk for city distribution, it had been found most satisfactory to use a dried skim milk and unsalted butter or a dry butterfat prepared by a low temperature process. These could be recombined in a city milk plant to give a palatable milk. There were several procedures: (i) The reconstituted skim milk was mixed with what fresh milk was available and some fresh cream if that was available, even from a distant source of supply. That procedure yielded a milk of excellent flavour, and if the proportion of fresh milk was greater than 20%, it was scarcely to be distinguished from fresh milk. (ii) The reconstituted skim milk was mixed with homogenized cream prepared from unsalted butter or from a dry butterfat of finest quality. That too gave a milk of good quality, but possibly not so attractive as that prepared by the first procedure, although it was favourably received when the consumer became accustomed to it. (iii) The reconstituted skim milk was mixed with fresh milk of high fat content, to give a whole milk of the required lower fat content. That "toned" milk was prepared for city distribution in a number of eastern countries. (iv) Skim milk powder might be dissolved in water to give a final reconstituted milk of higher concentration of non-fatty milk solids than was present in normal skim milk, to give a more attractive flavour.

Fluoridation.

A session was devoted to public health aspects of fluoridation of water supplies.

DR. G. N. DAVIES reviewed the present status of fluoridation as a public health measure, and DR. C. N. D. TAYLOR (Dunedin) described some of the problems which arose during the campaign for fluoridation at Hastings.

Dr. Davies pointed out that fluoridation was the most effective method of increasing the resistance of teeth to dental decay. It had been thoroughly tested by both laboratory and field trials, and had been endorsed by the Ministry of Health in the United Kingdom, the Department of National Health and Welfare in Canada, the United States Public Health Service and the World Health Organization, as well as by many National Research Councils, Medical Associations and Dental Associations.

Fluoridation of water and dietary methods of preventing dental decay were not mutually exclusive. Fluoridation would produce a beneficial effect even when individuals followed a strict diet. Extensive surveys in other countries had demonstrated that dental decay was less prevalent in areas where public water supplies contained one part per million or more of fluoride than in areas where water supplies contained no fluoride. All water supplies in New Zealand contained much less than the minimum amount of fluoride required to lower the prevalence of dental decay.

In the United States and Canada controlled studies had established: (*a*) that fluoride added to public water supplies by mechanical means reduced the prevalence of dental decay to the same extent as fluoride when it occurred naturally in water; (*b*) that the beneficial effects were produced in adults as well as in children; (*c*) that at the age of six to eight years, when the prevalence of dental decay in deciduous teeth was highest, the prevalence rate was reduced by from 42% to 54%; (*d*) that in children born after fluoridation began, the prevalence of dental decay in deciduous teeth was reduced by from 52% to 75%. In a temperate climate, at the optimum concentration of one part per million of fluoride, mild dental fluorosis might be expected in 2% to 3% of children, and very mild dental fluorosis might be expected in 6% to 10% of children who were born after fluoridation began. Those forms of dental fluorosis were of less significance than the idiopathic enamel defects which occurred in both non-fluoride and fluoride areas.

Numerous clinical, laboratory and radiographic studies established that in temperate climates the life-long consumption of water containing one part per million of fluoride produced no toxic manifestations detrimental to general health. Standard water works procedures would ensure that fluoride-bearing chemicals could be added to public water supplies with complete safety to both consumers and water works personnel. Fluoride concentrations of one part per million could be maintained with an error of *plus or minus* 0·1 part per million.

Dental decay was a major public health problem in New Zealand. The National Dental Service, which provided free treatment of the effects of dental decay in children, cost more than £1,530,000 per year. There were insufficient dental nurses and dentists in New Zealand to cope with the number of fillings that needed to be done. Even if the dental manpower position was adequate, the size of the problem would not be reduced by treatment alone. If fluoridation were adopted in New Zealand, the expected reduction in dental decay would enable dentists to cope with the effects of this disease in both children and adults, to undertake orthodontic treatment for the correction of malocclusion, which affected 50% of New Zealand children, and to undertake the treatment of periodontal disease, which affected 25% to 50% of adults. In addition, it would result in a marked reduction in oral sepsis, with a consequent improvement in general health. It would also result in less loss of time from school and industry. Fluoridation was the only effective public health measure for the partial control of dental decay.

Dr. Taylor summarized the two main arguments against fluoridation as: first, that fluoride was a poison, that it was dangerous to use, and that fluoridation was still in the experimental stages; secondly, that fluoridation was an attack on the liberty of the subject. It was pointed out that opponents of fluoridation failed to face the question of the quantity of fluoride used. They were unimpressed by the fact that over 1000 gallons of fluoridated water needed to be consumed at one sitting to produce acute fatal poisoning. Similarly, they would not accept carefully prepared statistics supporting fluoridation.

Concerning the moral argument, it was considered by supporters of fluoridation that the small amount of personal liberty necessarily sacrificed was outweighed by the moral wrong of depriving future generations of a proven benefit that was harmless and could reduce dental decay in children by up to 60%.

The introduction of fluoridation at Hastings was described, together with the campaign which was waged when opposition along the American pattern began eight months later. The unreliability of much of the anti-fluoridation propaganda was notable, as was the failure to give the Hastings public sufficient information about the value and safety of fluoridation. It was suggested that both the protagonists and antagonists of fluoridation were beginning to appreciate one another's sincerity and that, as had occurred with similar public health measures, common sense would eventually prevail.

Meanwhile time spent on educating the public about fluoridation was time well spent. That should be done by the dental and medical divisions of the Department of Health and also by dental practitioners, medical practitioners, nutritionists and dietitians in the towns concerned. Other citizens would undoubtedly assist, and foremost in New

Zealand had been the Junior Chamber of Commerce. It was a problem of fact *versus* emotion, and the tendency of the public to beware of experts had to be overcome.

Breast-Feeding.

Two papers were contributed on different aspects of breast-feeding.

DR. HELEN DEEM and DR. M. MCGEORGE (Dunedin) discussed ante-natal and post-natal factors in the initiation and maintenance of breast-feeding. It was explained that in order to assess the ante-natal and neonatal procedures advocated by Waller as aids in the establishment of lactation, a comprehensive clinical survey was made of 892 patients admitted to the Queen Mary Maternity Hospital, Dunedin, between September 1, 1952, and February 18, 1954. After their discharge from hospital, 90% of the patients were followed to the conclusion of lactation, largely through Plunket supervision.

Ante-natal preparation for lactation included the correction of defective nipples by the wearing of "Woolwich shells", followed later by instruction in the technique of manual breast expression; so that while lactation was being established, mothers could themselves adequately empty their breasts after each feed. The two procedures diminished the incidence of cracked and painful nipples, and of breast engorgement. In spite of the preventive measures, however, certain types of breasts were still liable to engorgement.

The most frequent cause of failure of breast feeding appeared to be failure of milk secretion. That was the factor responsible in 44% of the cases in which the infant was artificially fed on discharge from hospital, and was also predominant in the majority of cases of complementary feeding and early subsequent weaning. A study of the milk output on the fourth, seventh and tenth days of the puerperium showed that in the latter cases the increase in output was well below the average figure—a point of considerable prognostic significance.

The present survey had shown that assistance in the ante-natal and neonatal periods had contributed materially to the successful establishment and early maintenance of lactation, but that after two or three months the number of those women successfully breast-feeding their babies did not differ significantly from the national average disclosed in the survey conducted by Dr. Deem in 1951-1952.

DR. JOAN WOODHILL described her studies on the incidence and duration of lactation in Australian women in relation to diet and obesity. She said that Australia was one of the countries where the incidence of breast feeding was relatively high. The incidence of lactation in all mothers confined at the obstetric unit of the Royal Newcastle Hospital during a year was described, and then followed data on the number of babies completely breast fed through the first, third, sixth and eighth months of life.

It was believed that maternal obesity was one of the factors affecting unsatisfactory lactation. The incidence and duration of lactation of the subjects in the groups studied were related to the weight status of the mother at the beginning of her pregnancy. All the subjects were rated for weight with respect to a standard of eight for Australian women of child-bearing age. A woman was considered to be obese if she was two standard deviations or more above the mean weight for her age and height. The lactation of these obese women was compared with groups of women of average weight and under-weight.

The relation of diet to obesity was studied, and both the qualitative and quantitative aspects were considered. The nutritional intake of the mother was related both to obesity and to duration of lactation.

From these results it would seem that a fat woman registered in an ante-natal clinic should be viewed with concern with respect to her dietary status and ability to maintain lactation. Educational measures should be taken at once to point out to her that it was undesirable to continue to eat a high carbohydrate diet, and that it was important to increase her intake of protein, vitamins and minerals. Other factors in lactation should be discussed with her and every care taken that in the event of her being unable to feed her baby, she should not be made to feel inadequate or incompetent as a mother. If she did feel that, it would be reflected in the relationship she had with her baby. The attention of the nutritionist should not be restricted to the overweight patient, because the data showed that there was a considerable number of underweight women who were not able to feed their babies satisfactorily.

Another paper of medical interest dealt with nutritional studies in malignant disease. MISS CAROLINE TURNER (Melbourne) pointed out that the study of malignant disease occupied a major place in medical research throughout the world, but until recently little work had been done on the nutritional aspect. It was now evident that there was much work to be done in this field, and nutritional and metabolic studies were revealing important information on the nature of the cancer cell, and on the treatment of cancer patients.

Nutritional studies were being carried out at the Peter MacCallum Clinic, Melbourne, and urinary amino acid and calcium excretion in patients with active malignant disease was being investigated. Studies had been undertaken to determine whether malignant cachexia was truly an entity or rather a result of undernutrition. A number of factors had been found to be the cause of undernutrition in cancer patients. Factors such as obstruction or lesions of the alimentary tract, radiation reactions, emotional disturbances and worry, anorexia and continued nausea had all been responsible for a reduced intake of food and consequent loss of weight. The possibility of impaired absorption and alterations in the basal metabolic rate as factors in malignant cachexia was considered. In many instances it was possible to correct undernutrition in cancer patients and restore or maintain a reasonable weight.

SECTION N: PHYSIOLOGY AND BIOCHEMISTRY.

PROFESSOR J. C. ECCLES (Canberra) delivered his presidential address to the Section of Physiology and Biochemistry on the topic "The Generation of Impulses by Nerve Cells". He began by briefly reviewing the modern ionic theory of the nerve impulse and the chemical mechanism of transmission across synapses, stating that it could now be taken as established that transmission across synapses occurred not by the spread of electrical currents, but by specific chemical substances which impulses caused to be liberated from the presynaptic membranes, just as occurred with acetylcholine at the neuro-muscular junction. Those transmitter substances altered the ionic permeability of the subsynaptic membrane and consequently initiated specific ionic fluxes across that membrane; those in turn were responsible for the transient depolarization or hyperpolarization of the post-synaptic membrane which was produced respectively by excitatory or inhibitory action. Those responses of a wide variety of nerve cells had been studied by the new technique of intracellular recording. If the excitatory synaptic action caused a sufficient depolarization of the post-synaptic membrane, it generated the discharge of an impulse. It was now established that such a depolarizing synaptic potential always preceded an impulse that was generated by synaptic stimulation. Furthermore, when a nerve cell was excited in various ways, the generation of impulses occurred virtually at the same levels of depolarization. With almost all varieties of nerve cells the spike potential as recorded intracellularly was double, an initial small spike potential of 30 to 40 millivolts preceding the large spike of 80 to 100 millivolts that signalled the propagation of the impulse over the soma and dendrites of the neuron. There was now a great deal of experimental evidence establishing that in those cells the impulse arose in the initial segment of the axon (the axon hillock *plus* the non-medullated segment) and propagated thence down the axon and over the soma and dendrites. It was postulated that the surface membranes of the initial segment and of the soma-dendrite components of the nerve cell differed in that the threshold depolarization for initiation of an impulse was much lower for the former (10 millivolts) than for the latter (about 30 millivolts). It was shown that this postulate accounted satisfactorily for the results of a fairly intensive experimental investigation. It was further argued that this especially low threshold of the initial segment ensured that impulses were always generated at the initial segment; and hence the nerve cell was a particularly good integrator of the synaptic excitatory and inhibitory bombardment to which it was subjected. All that diverse action was effective in so far as it altered the membrane potential of the initial segment, and only when this was depolarized by about 10 millivolts was an impulse generated. Finally, a brief report was given of an investigation of the changed behaviour of motor nerve cells during the reaction of chromatolysis that occurred for a few weeks after their axons had been cut. It appeared that the initial segment lost much of its selective excitability and that patches of the dendritic membrane became highly excitable. On account of that pathological behaviour the chromatolysed cells were very defective integrators of the synaptic bombardment upon them.

Chemistry, Physiology and Pharmacology of the Circulation.

A conjoint session of Sections N and O was held under the chairmanship of DR. S. E. WRIGHT (Sydney) and

PROFESSOR J. C. ECCLES (Canberra), on the chemistry, physiology and pharmacology of the circulation.

DR. J. G. BLACKMAN and DR. F. N. FASTIER (Dunedin) opened the session with a paper which discussed "Tolerance to Ganglion-Blocking Compounds". The development of tolerance in human subjects was described. It was stated that the investigation of this phenomenon was rendered difficult by inability to produce tolerance in experimental animals, of the same degree as that observed in hypertensive patients.

Experiments were described which indicated that tolerance to the ganglion-blocking action of hexamethonium and related compounds was unlikely to result from the production of a metabolite which acted as a competitive inhibitor. Tolerance to parasympathetic ganglion blockade had been found to occur, and that did not support the view that tolerance to drugs like hexamethonium was essentially a vascular phenomenon.

Other explanations of tolerance compatible with experimental evidence were considered, including decreased alimentary absorption and initial decreases in renal excretion with later recovery.

DR. F. N. FASTIER, DR. H. J. WAAL and DR. L. C. K. WONG (Dunedin) reported an investigation of some 90 compounds, most of them aryl diguanides and S-aralkyl *iso*thioureas with nuclear substituents, which had been tested to see if they resembled serotonin (5-hydroxytryptamine) in certain of their pharmacological properties. Many of the compounds were found to produce certain chemoreflexes known to be evoked by serotonin. Such compounds produced in lightly anæsthetized cats (i) a sharp, transient fall of blood pressure, (ii) slowing of the heart rate, and (iii) temporary arrest of breathing; but only if the vagi were intact. Those effects were brought about reflexly by stimulation of receptors situated in the heart and lungs. Some of the compounds had been shown to resemble serotonin also in stimulating cutaneous pain receptors.

With various series of compounds, activity increased as the chemical structure of the compounds approximated more nearly to that of serotonin. However, some close relatives of serotonin — notably tryptamine itself — displayed surprisingly little activity. Compounds of the phenyl diguanide type did not resemble serotonin at all in certain respects. For example, they displayed little or no antidiuretic activity and they did not prolong the hypnotic effect of barbiturates or of chloral hydrate.

PROFESSOR F. H. SMIRK (Dunedin) reviewed homœostatic adjustments of the activities of the heart and blood vessels occurring in response to a variety of pressor and depressor stimuli and the effects of conditions influencing the blood volume on them. He said that such homœostatic mechanisms, which remained active in the hypertensive patient, involved responses of the sympathetic nervous system and adrenal hormones. Patterns of response were exemplified by the report of a clinical experimental study in hypertensive and normal subjects.

DR. E. G. MCQUEEN (Dunedin) reported experiments in which a comparison was made between normal rats and rats with experimental renal and renoprival hypertension, in relation to the reactivity of the vasculature. Isolated hindquarters were perfused at a constant rate with Ringer dextran or Ringer polyvinylpyrollidone solution, and the measure of vascular reactivity was the mean rise in perfusion pressure to a series of doses of noradrenaline. Larger rises in perfusion pressure occurred when hindquarters from rats with renal and renoprival hypertension were employed. In the renoprival hypertensive preparation, vascular reactivity was shown to depend on the presence of the adrenals and sodium metabolism. The results of the experiments suggested that the common denominator for the various forms of experimental hypertension was an increased vascular reactivity.

DR. L. F. DODSON and DR. G. B. MACKANESS (Canberra) reported an investigation of the pressor responses to renin and hypertensin of normotensive pregnant and non-pregnant rats. During the latter part of pregnancy it was found that the pressor responses to the intraperitoneal injection of renin declined progressively. At term pregnant rats failed to give a pressor response. Sensitivity to renin returned rapidly in the post-partum period and usually by the second day was normal. The sensitivity of rats to the intravenous injection of hypertensin was not decreased by pregnancy. It was suggested that during late pregnancy in the rat there was an interference with reaction of renin with hypertensinogen, and that this might be the cause of the antipressor effect of pregnancy in renal hypertensive rats.

PROFESSOR D. DENNY-BROWN (Harvard) discussed the collateral circulation of the cerebral cortex. He said that the carotid artery might be occluded in one person without symptoms, yet in others varying lesions up to infarction of most of a cerebral hemisphere might follow. Varying degrees of recovery occurred in the first few days after occlusion. An experimental study was made in monkeys and cats, in which the polarographic method of measuring local changes in tissue oxygenation was used. The studies indicated that, in spite of the extreme vascularity of the cerebral cortex, there was but a narrow margin of oxygen reserve. After occlusion of one or both carotid or vertebral arteries the severity and duration of the ischæmia of the cortex depended on the contribution of the anastomatic vessels on the surface of the brain. Occlusion of the middle cerebral artery was followed by a fall in the local oxygen availability in the distribution of the occluded vessel, which was maximal in eight to twelve seconds. There was a bordering zone on which the tissue oxygen availability was unstable and an outer anastomatic zone in which oxygen availability and temperature rose owing to increase of the local collateral circulation. The area of ischæmia was minimized by breathing pure oxygen and was increased by a fall in blood pressure. The collateral circulation was not improved by cervical sympathectomy, stellate ganglionectomy or section of the seventh nerve.

DR. B. T. BROWN and DR. S. E. WRIGHT (Sydney) reported the types of cardiac glycosides and metabolites found in human and rat urine after administration of the cardiac glycosides. They said that after cardiac glycoside administration to rats, the urine contained, as well as the administered glycoside, a number of cardioactive metabolites. By means of partition column chromatography, combined with paper chromatography, the urinary excretion of the three clinical glycosides, lanatoside C, digoxin and digitoxin, had been investigated. After administration of lanatoside C and digoxin, human urine contained original glycoside together with the same metabolites previously found in rat urine. After administration of digitoxin, however, no free glycoside could be detected in rat urine. The results indicated that the qualitative, though not necessarily the quantitative, metabolism of the glycosides was similar in both species.

Neurophysiology.

A number of papers were delivered dealing with different aspects of neurophysiology.

DR. D. I. B. KERR (Adelaide) discussed properties of the neurons of the olfactory bulb. He said that the olfactory bulb contained several different synaptic regions—for example, (*a*) fibres from the olfactory receptors synapsing with apical dendrites of mitral and tufted cells, (*b*) recurrent collaterals of the lateral olfactory tract synapsing with accessory dendrites of these cells, and (*c*) anterior commissure fibres synapsing with granule cells, and granule cell axons synapsing with accessory dendrites of mitral and tufted cells. Recovery cycles and the characteristics of the action potentials in the bulb evoked at various frequencies of lateral olfactory tract and anterior commissure stimulation had been analysed in various ways.

Afferent synaptic mechanisms were discussed by DR. R. F. MARK (Dunedin). With techniques of unitary and population analysis, an attempt had been made to bring to light the general properties of the specific projection systems relaying sensory information from peripheral nerves to the cerebrum and cerebellum. All experimental manœuvres undertaken had emphasized a basic similarity between those two great afferent systems. It was concluded that, in contrast to the monosynaptic reflex path, spatial and temporal summation were insignificant features of the afferent synapses in so far as the initiation of minimal propagated post-synaptic discharge was concerned. The presence of both convergence and repetitive action suggested that one function of this synaptic mechanism might be the recording of spatial patterns among many presynaptic fibres into temporal patterns in individual post-synaptic fibres.

The pharmacological analysis of synaptic transmission in sympathetic ganglia was discussed by DR. ROSAMUND M. ECCLES (Canberra). She said that curarization of sympathetic ganglia blocked transmission of impulses through the ganglia. However, preganglionic stimulation still produced potentials, post-synaptically. Those potentials were studied in detail after administration of various pharmacological agents, such as adrenaline, strychnine, veratrine and the anticholinesterases. From their action it was concluded that synaptic transmission in the sympathetic ganglion was more complicated than at the neuro-muscular junction, where there appeared to be only a single transmitter operating on a single type of membrane receptor.

DR. G. H. SATCHELL (Dunedin) discussed responses of central neurons in fishes. He said that many reticular cells in the Elasmobranch medulla sent their axons down the cord as Muller fibres, and by stimulating them at various distances along the cord it had been possible to study their distribution and conduction velocity. A single stimulus to certain nerves—for example, lateral line nerve—would fire many of these units by synaptic action, the response being a single spike or a train of spikes. Many reticular cells fired spontaneously, and a stimulus through an ipsilateral nerve caused a transient acceleration of firing rate. In some units a stimulus to a contralateral nerve would cause a transient inhibition of such a discharge. Gentle stroking of the skin commonly produced acceleration of firing if it was on the ipsilateral side, and inhibition if on the contralateral side, and was effective over a wide area of the body and fins.

Time courses of motoneuronal responses were discussed by MR. J. S. COOMBS, DR. D. R. CURTIS and PROFESSOR J. C ECCLES (Canberra). It was stated that the time constant of the motoneuronal membrane had been measured directly, in cells impaled with double microelectrodes, by passing rectangular current pulses through one barrel of the electrode. The potentials measured by the other barrel had been corrected, by means of an electrical network, for the responses due to the electrode alone. In that fashion a figure of approximately 2·5 metres per second had been obtained, and that had been used to determine the time course of the subsynaptic currents and hence the transmitter actions responsible for the excitatory post-synaptic potential (EPSP) and the inhibitory post-synaptic potential (IPSP). Both transmitters had an initial intense phase of action, and, contrary to previous accounts, a residuum of excitatory transmitter persisted during the decaying phase of the EPSP. Independent confirmation of this had been obtained by the interaction of an antidromic impulse with the monosynaptic EPSP.

The convergence of monosynaptic excitatory afferents onto motoneurons was discussed by PROFESSOR J. C. ECCLES, DR. R. M. ECCLES and DR. A. LUNDBERG (Canberra). The fields from which different motor nuclei drew their monosynaptic innervation had been investigated with intracellular recording from more than 400 cells belonging to 22 different classes of motoneurons. The ventral roots were left intact in order that the antidromic invasion could serve for identification of the cell. The magnitude of the EPSP's established from various muscles provided a quantitative measure of the receptiveness of the cell. Cells of the slow postural muscles, soleus, crureus and *caput medialis* of *triceps brachii* received a larger total aggregate of monosynaptic EPSP than cells of fast muscles.

PROFESSOR A. K. MCINTYRE (Dunedin) discussed cortical representation of superficial and deep sensibility. Experiments had been carried out with the object of determining the size range of those afferent fibres in cutaneous and muscle nerves which relayed their activity by simple pathways to the cerebral cortex. In the case of cutaneous nerves, impulses in a very small number of the largest afferent fibres could elicit a cortical response, and the medium-sized cutaneous nerves were very effective. Afferent volleys in muscle nerves evoked smaller cortical responses of more restricted spatial extent. The largest afferent fibres in muscle nerves did not relay their activity to the highest levels. Afferent fibres in the Group II size range would appear to be responsible for the cortical responses. The synaptic relays traversed by both skin and muscle afferent volleys *en route* to the cortex must be extremely powerful, as shown by their resistance to anæsthesia and by other physiological tests.

The durations of after-hyperpolarization of motoneurons supplying fast and slow muscles were discussed by PROFESSOR J. C. ECCLES, DR. R. M. ECCLES and DR. A. LUNDBERG (Canberra). The spike potentials of motoneurons supplying the slowly contracting skeletal muscles were followed by an after-hyperpolarization that generally was much longer than with other motoneurons, durations in excess of 200 metres per second being sometimes observed. The conduction times for propagation over a given distance by impulses in their motor axons also tended to be more prolonged. However, a few motoneurons supplying muscles that predominantly were of the fast type also had relatively prolonged after-hyperpolarizations and axonal conduction times. The durations of after-hyperpolarizations had been plotted against the axonal conduction times for a large number of motoneurons supplying slow and fast muscles operating at the ankles, knee and elbow joints, and an approximately linear relationship was disclosed. The significance of the observations would be discussed in relationship to the frequencies of the rhythmic discharge of impulses to fast and slow skeletal muscles.

Brain and Mind.

A joint symposium of Section N (Physiology and Biochemistry) and Section J (Education, Philosophy and Psychology), on the subject of "Brain and Mind", was held under the chairmanship of PROFESSOR J. L. MACKIE (Dunedin).

The problem of body and mind was discussed by DR. H. THORNTON (Dunedin). He said that "dualism" was both an habitual mode of awareness and an "official doctrine" (Cartesianism). The latter was a "myth" (Ryle) both in a potent and trivial sense. It was gratuitous, and merely convenient, to make Descartes responsible for "Cartesianism"—for dualism as a mental habit. The Cartesians made the problem of body and mind. Amongst present-day attempts on the problem the potency of Cartesianism appeared particularly in Stout. Stout had eventually tried to restate the problem, which did not appear to be a merely scientific one. It demanded cooperation, and over different fields of investigation. Such demands had peculiar difficulties. But dualistic formulations of the problem seemed finished. Either it was no problem, or science itself would change before it was solved.

DR. D. I. B. KERR (Adelaide) reconsidered the "motor theory" of mind. He said that in the "motor theory" mind was the process which transformed sensory patterns into patterns of motor coordination. Processes brought into action by a sensory stimulus led to a response. This might be a stereotyped reaction of short latency (essentially reflex), or alternatively there might be a marked delay before the response appeared, during which time a choice of alternative responses was being made. Mind would not be invoked in the former situation, whilst the selectivity of response which went with a selectivity of attention in the case would seem to be a prime attribute of what was called mind. In the past the motor aspect, in the somatic sense, had been too much emphasized. Selectivity of attention was not motor, neither were the frequently found concomitant autonomic responses motor in the sense implied by the old motor theory. The physiological processes of awareness involved more than overt action. During attention some neural processes were activated and others inhibited. Only recently demonstrated, though long ago suggested, was the ability of so-called "higher" centres to select the type of afferent input which was going to enter consciousness. One additional motor activity of mind was thus the selective inhibition of afferent signals at various levels between the receptor and the ultimate motor response.

"The Brain and Memory" was discussed by DR. R. G. ROBINSON (Dunedin). He said that memory might be described as the process by which behaviour was modified by previous experience. Consideration of memory in the intact man indicated that auditory and visual memory decayed exponentially with time unless reinforced. The information was compressed but embellished as well. The syndrome of the phantom limb was an example of this process.

Many destructive conditions of the nervous system caused defects in memory. Destructive lesions of the cerebrum gave an auditory and visual memory defect that was proportional to its size and not dependent upon location. Damage to the walls of the third ventricle produced severer effects than size would warrant. The memory defect affected visual, auditory and sensorimotor events.

The sensory input to the cerebral cortex was an essential component of memory. There was the classical specific path that was stable under adverse circumstances. There was a second path of less certain course called the non-specific system. For the functioning of the memory process the cortex needed to have sensory information from both paths. Patients with third ventricle lesions were aware of their environment, but were unable to retain their impressions for any length of time. This was probably due to imperfect functioning of the non-specific system. It was suggested that in man the hippocampus had become an additional non-specific system for the auditory and visual processes of the brain. This reflected the dominance of such processes in human cerebral function.

DR. J. P. RYAN (Wellington) pointed out that one of the oldest problems in human thought, and a present one in both psychology and physiology, was that of the relationship between mind and brain. There were really two problems involved: could one talk of mind at all; and if so, what was its relationship to the brain?

The psychologist today seldom if ever used the term mind as a part of his science. He preferred to speak in observables—the behavioural variables. Although he used intervening variables to tie sets of observables together, he avoided using such constructs as "mind" that had surplus meaning beyond the function of an intervening variable. Some psychologists, such as B. F. Skinner, succeeded in using so few intervening variables that they could, with Skinner, justify calling their systems "descriptive behaviourisms".

If it was felt that there was something called to mind to be explained, it was necessary to establish some neurophysiological correlate to enable the explaining to occur. The common approach of the past had been to attribute mind to the brain, as some sort of as yet unexplained by-product or concomitant. However, it was possible to show that no evidence had been produced as yet to show that the brain was the *sine qua non* of the mind; although it was probable that certain experiments, resembling those of Harlow and Stagner on the effect of curare on the cortex, could provide a definite guide to the relative roles of the central and peripheral nervous systems in the production of the phenomena called "mind".

Endocrine Responses to the Environment.

A joint symposium between Sections N and Ib, chaired by DR. W. G. WHITTLESTONE (Hamilton), concerned itself with endocrine responses to the environment.

PROFESSOR W. V. MACFARLANE (Brisbane) discussed mammalian endocrine adaptations to the tropics. He said that it was probable that all endocrine and cellular functions were set at a new level when a mammal lived, for several months, above its level of thermal neutrality. The three groups of hormones that would be considered, however, were concerned with metabolism, water and salt regulation, and reproduction.

Metabolic rate and thyroid activity had been found to be depressed in rats, sheep and man by periods of living at temperatures above 30° C. Food intake was reduced and water intake increased. The metabolically active components of the adrenal steroid secretion appeared also to be depressed during the hot seasons and elevated during the cooler parts of the year. That applied to 17-ketosteroid output and 17-hydroxycorticoid excretion.

Evaporative cooling by sweating or panting demanded water. Water metabolism was closely linked with sodium balance, particularly in sweating animals. The relatively poor supply of sodium chloride available to ruminants made them salt-dependent, even though they did not sweat, and they showed a close linkage between salt retention and water retention. The intake of water by man and sheep might be increased about 12 times in summer above winter levels of water intake, by work in the heat. When evaporative cooling was employed in the hotter parts of the year, antidiuretic hormone appeared in the blood to reduce urine flow. Urine flow was, however, reduced at those times without there being measurable amounts of antidiuretic hormone in the blood. The antidiuretic hormone appeared to be an adjuvant to other water-saving mechanisms. Antidiuretic hormone was released by heat (four hours at 41° C.) in summer, but not in winter, in man and sheep. In man and sheep it had been observed also that the ratio of potassium to sodium in the urine (which was proportional to aldosterone activity) was high in summer and low in winter. That was associated with aldosterone excretion such as that described by Naher and Wettstein, following sweat-producing exercise. In man it had been found that the potassium-sodium ratio in the urine became high within one hour of exposure to a temperature of 40° C., presumably to compensate for sweat loss of sodium. As the potassium-sodium rose, the antidiuretic hormone concentration in the blood also rose. In sheep the ratio of potassium-sodium fell during heating (as water but not sodium was panted off) and rose again when water was replaced, so sodium was retained. Artificial acclimatization of sheep by means of DCA (0·15 milligramme per kilogram given intramuscularly) did not produce antidiuretic hormone at rest in a neutral environment (22° C.), but on heating the animals were found to have high levels of antidiuretic hormone in the plasma. That action lasted for about one day, and after that heat again, in winter, produced no antidiuretic hormone. It appeared that the salt-saving hormones, which appeared earlier in the hot season than antidiuretic hormone, prepared the cells by increasing the amount of intracellular sodium and decreasing the amount of intracellular water, so that there was a more facile release of water-saving hormone.

It had been observed some years previously that in the northern parts of Australia there was a 30% reduction in conceptions during summer relative to winter conceptions. Comparison of towns of similar population in the north and south of the country had shown lower reproductive rates in man in the hot region than in the cooler parts to the south. Amongst sheep and cattle in the tropical regions there was poor reproduction. In the tropical pasture lands it was rare to find more than 60% of conceptions in ewes and cows. In rats and rabbits it had been found that large proportions of fœtuses resorbed if the animal was maintained at a temperature of approximately 35° C. Analysis of this fœtal resorption had shown that thyroid hormone supplements, increased protein and increased vitamin intake or supplements of progesterone could save a certain proportion of fœtuses from resorption. Acclimatization, however, appeared to be the most satisfactory means of protecting the fœtus, even though the number of ovulations was reduced by acclimatization for one month at 35° C. The protection afforded by acclimatization was completely overcome by injections of two milligrammes per day of cortisone. It appeared that excessive mobilization of cortisone or hydrocortisone might account for fœtal resorption. Such resorption seemed to occur in sheep also, and it appeared possible that the human fœtus might be resorbed in the early stages of gestation if the mother was exposed to high ambient temperatures. Such temperatures, up to 110° F., occurred in the summer in the Australian tropics.

The response of rats to cold was discussed by DR. H. D. PURVES and R. HORNABROOK (Dunedin). It was stated that chronic sensitivity to cold, developing twenty-four hours after hypophysectomy and increasing in intensity during the next two or three weeks, was due to loss of corticotrophin and thyrotrophin and resultant inactivity of adrenal cortex and thyroid gland. Treatment with cortisone acetate and L-thyroxine in combination was highly effective in restoring normal cold adaptation to hypophysectomized rats. Other anterior lobe factors, particularly growth hormone, did not appear to be necessary for normal cold adaptation.

DR. W. E. GRIESBACH (Dunedin) described pituitary cytology as affected by cold adaptation. He said that in rats exposed to cold for some time increases occurred in the number of thyrotrophic cells in the anterior part of the pituitary. Slides demonstrating such pituitaries were projected.

Endocrinology.

Several papers were concerned with different aspects of endocrine activity.

DR. GRIESBACH, DR. JAMES, DR. LLAURADO and DR. ROBINSON (Dunedin) discussed some effects of hypophysectomy in man. It was stated that 21 patients with disseminated cancer of the breast had been subjected to surgical hypophysectomy with immediate death in three cases. On the negative side two patients with cancers arising during pregnancy were not influenced by the procedure. Many patients had been followed for only a short time, but two patients had survived for over a year. There was often great relief from pain in those with bony metastases. Cutaneous deposits tended to heal. There was a differential effect whereby skin metastases might be held in check while lymphatic and visceral deposits progressed. The ability of the kidney to retain water was reduced. The patients were easily maintained on cortisone and thyroid. The pituitary glands were put into fixative as soon as they had been removed. The histological appearances were without the usual features of post-mortem autolysis and were comparable with those of Romeis. Special staining methods had been used to confirm the presence of three different types of basophile cells, whose postulated function concerned the thyroid gland and gonads. So far the pre-operative endocrine status had thrown no light on the identity of the different types of basophile cells.

The urinary sodium-potassium ratio was not diminished in some cases after operation. When the ratio was affected, the fall was gradual and not sudden. Aldosterone was assayed in the urine before and after hypophysectomy in some patients. It was found that aldosterone production persisted, at least partly, after hypophysectomy.

DR. LLAURADO and PROFESSOR WOODRUFF (Dunedin) delivered a paper on the role of aldosterone in the metabolic response to trauma. Retention of sodium and increased excretion of potassium were familiar and striking features of the metabolic response to surgery. It had been shown by means of a bioassay that those changes were associated with an increase in the urinary excretion of an electrolyte-regulating corticoid having the biological properties of

aldosterone. By the time the electrolyte levels in the patient's urine returned to normal, the aldosterone levels had also returned to normal. It had been suggested that this metabolic phenomenon be called "post-operative transient aldosteronism". Chemical investigations undertaken in collaboration with Wettstein and Neher, of Basle, had confirmed that this corticoid was aldosterone.

It was suggested that the increased excretion of aldosterone reflected an increased circulating level of this hormone, and that this was the principal factor responsible for the associated post-operative electrolyte changes. Subsequent investigations had shown that there was a slight but clear-cut temporary increase in serum potassium content about six hours after major surgical operations. It was thought that that might be due to absorption of potassium from damaged cells in the operative field, and it was suggested as a hypothesis that the increase in serum potassium content might stimulate increased aldosterone production by the adrenal cortex. An alternative hypothesis which might be put forward to account for the aldosteronism was that, after surgical trauma, liver function was temporarily impaired, and, in consequence, there was a diminution in the rate of destruction of aldosterone. That hypothesis had not yet been investigated.

The dietary iodine and thyroid function were discussed by DR. T. H. KENNEDY (Dunedin). He said that the proportion of the combined iodo-amino acids of the thyroid had been measured in rats maintained on different iodine intakes. The corresponding values for the free iodo-amino acids of the thyroid and the plasma had also been determined. The ratios of mono-iodo-tyrosine to di-iodo-tyrosine and of tri-iodo-thyronine to thyroxine increased with decreasing iodine intakes.

Medical Practice.

THE RESPONSIBILITIES OF THE MEDICAL PROFESSION IN THE USE OF X RAYS AND OTHER IONIZING RADIATION.

THE following statement has been prepared by the United Nations Scientific Committee on the effects of atomic radiation.

I. Introduction.

1. The United Nations General Assembly, being aware of the problems in public health that are created by the developments of atomic energy, established a Scientific Committee on the Effects of Atomic Radiation. This Committee has considered that one of its most urgent tasks was to collect as much information as possible on the amount of radiation to which man is exposed today, and on the effects of this radiation. Since it has become evident that radiation due to diagnostic radiology and to radiotherapy constitutes a substantial proportion of the total radiation received by the human race, the Committee considers it desirable to draw attention to information that has been obtained on this subject.

2. Modern medicine has contributed to the control of many diseases and has substantially prolonged the span of human life. These results have depended in part on the use of radiation in the detection, diagnosis and treatment of disease. There are, however, few examples of scientific progress that are not attended by some disadvantages, however slight. It is desirable therefore to review objectively the possible present or future consequences of increased irradiation of populations which result from these medical applications of radiation.

II. General Survey of the Irradiation of Human Beings.

3. Man has always been exposed to some irradiation from natural sources. To this has now been added, as a result of modern discoveries and the applications of ionizing radiation and radioactivity, certain forms of artificial irradiation.

4. Natural irradiation is due to: (i) cosmic radiation; (ii) "background" gamma radiation from radioactive substances present locally in the earth, rock or building materials, and from disintegration products of radon in air; (iii) radiations emitted from natural radioelements such as potassium 40, radium, radon and carbon 14 which are incorporated in the body.

5. The amount of this natural radiation varies with locality, but has been estimated as usually delivering between 70 and 170 mrems per year to the gonads. Of this total, the major contributions are of about 45% from local gamma radiations, 30% from cosmic rays and 20% from body potassium 40.[1]

6. Artificial irradiation is derived from: (i) the contamination of the environment, the atmosphere, or water by radioactive waste from atomic industries or from users of radioelements; (ii) the radioactive fallout, at greater or lesser distances from the source, or radioactivity resulting from the explosion of nuclear devices; (iii) the occupational exposure of certain groups of workers: medical practitioners, radiologists, dentists, nurses, atomic energy workers, uranium or thorium miners, and the industrial or scientific users of radiation generators or radioactive isotopes; (iv) the medical use of X rays, other ionizing radiations and radioelements in the detection, diagnosis, investigation and treatment of human diseases; (v) the use of certain devices which emit radiation, such as television receivers, watches with luminous dials, and the X-ray generators used for the purpose of fitting shoes.

7. The amount of artificial radiation must vary considerably in different countries, and we have inadequate information as to the over-all significance of these factors. In certain countries where estimates have been made, it appears that the greatest gonad irradiation of the population is due to diagnostic radiological procedures, the amount from this source about equalling that from all natural sources in certain instances. The total present contribution from occupational exposure, from the products of atomic industries, from radiotherapy and from the radiating devices mentioned above (paragraph 6, subparagraph (v)) is likely to be very considerably smaller. That from radioactive fallout to the gonads appears at present to be in the region of 1% of the natural gonad irradiation in most areas.[2]

8. Both the magnitude and the significance of these various sources are under review by the Committee. Since medical irradiation accounts for a substantial if not the major portion of all artificial exposure, it is important that its magnitude should be known accurately for different countries and circumstances. The possibility of making such an assessment depends upon the help of the medical profession, and particularly on the adequacy and availability of records kept by doctors, dentists and organizations responsible for the use of ionizing radiation.

III. Radiation Hazards.

9. The medical use of radiation is clearly of the utmost value in the prevention, diagnosis, investigation and treatment of human disease, but the possible effects of this irradiation of individuals require examination.

10. Generally speaking, the irradiation of living beings may produce radiobiological effects either on the irradiated individual himself or, through him, on his descendants, the former being termed somatic and the latter genetic effects. Somatic effects vary according to the different organs or tissues affected, and range from slight and reversible disturbances such as cutaneous erythema to the induction of leuchæmia or of other malignant diseases. The possible reversibility of the somatic effects of radiation received in small doses or at low dose rates encourages the belief that there are permissible doses of radiation which will not cause completely irreversible or significant somatic damage. The threshold for occasional somatic damage may, however, prove to be low. In the case of genetic effects, on the other hand, there may be no threshold. These effects increase with a frequency corresponding to the total amount of radiation received by the germinal tissues, and in the great majority of cases are adverse.

11. Many other factors complicate the interpretation of radiobiological effects. The differences between whole and partial body radiation, between a single exposure and continuous irradiation, or between the effects of different types of radiation, are still imperfectly understood. Biological differences in the radiosensitivity of various tissues, or of the tissues of people of different age or sex, obviously influence the nature of radiation hazards. It is clear, however, that any radiation of gonads, and any substantial irradiation of other tissues, involve a chance of significant damage which requires assessment.

[1] From reports sent by India, Sweden, the United Kingdom and the United States of America.

[2] According to the reports sent by the United Kingdom and the United States of America.

IV. General Recommendations Regarding the Medical and Occupational Irradiation of Human Beings.

12. The radiological profession, through the International Commission on Radiological Protection,[1] has undertaken a valuable and responsible duty in defining maximum permissible limits of exposure for the main radiation hazards.

13. The establishment of these maximum permissible levels for those who are occupationally exposed to radiation depends on the view that there are doses which, in the light of our present knowledge, do not cause detectable somatic injury in the individual irradiated; and on the consideration that the number of individuals concerned is small enough for the genetic effects on the whole population to be negligible. For the gonads, or for irradiation of the whole body, the levels are such as to exclude doses greater than 0·3 rem in any week or 3·0 rem in any thirteen weeks, or a sustained irradiation rate greater than 5·0 rem per year. These values imply that no total dose of over 50 rem will have been received by the gonads by the age of thirty, or of over 200 rem by the whole body by the age of sixty in any occupationally exposed person.[2] As regards irradiation of the whole population, it is considered prudent to limit the average dose to germinal tissues from artificial sources to the order of magnitude of that received from all natural sources.

14. In considering the extent to which the population is irradiated for medical purposes, it is essentially the genetic hazard which is involved, although it seems possible that in certain circumstances somatic injury may occur occasionally after low doses of radiation arise. Otherwise, the relevant dose is that indicating the mean gonad irradiation among the population as a whole up to the end of the average reproductive period.

15. The extent of such genetic irradiation from diagnostic procedures has been found to be equal to at least 100% of all natural radiation in two countries,[3] and that from a third equalled at least 22% of this figure.[4] Even before obtaining more exact values for these and other countries, it is clear that the exposure can be substantial in countries with extensive medical facilities, and that it is essential to consider any ways in which this exposure could be reduced without detriment to the existing or developing value of medical radiology.

16. The Committee is therefore anxious to obtain the help of radiologists in suggesting through appropriate governmental channels any methods by which this total exposure could be reduced and in estimating the amount of reduction that might be expected from any such methods. In particular it would be valuable to know how much the radiation to the gonads could be reduced (*a*) by improved design or shielding of equipment, (*b*) by fuller training of any individuals using radiographic or fluoroscopic equipment, (*c*) by any local shielding of the gonads that is practicable, especially during abdominal or pelvic examination, (*d*) by the use of techniques involving radiography rather than fluoroscopy when full information can be obtained by this means, (*e*) by improvement of administrative arrangements designed to obviate unnecessary repetition of identical examination of the same subject, and (*f*) by a general study of certain medical conditions such as that of peptic ulcers, to identify the circumstances in which the establishment of a radiological diagnosis has or has not a definite influence upon the treatment or prognosis given.

VI. Summary.

1. The Scientific Committee on the Effects of Atomic Radiation established by the United Nations General Assembly accepts the view that the irradiation of human beings, and especially of their germinal tissue, has certain undesirable effects.

2. Information received so far indicates that, in certain countries (Sweden, United Kingdom, United States of America), by far the most important artificial source of such irradiation is the use of radiological methods of diagnosis and that this may be equal in importance to radiation from all natural sources. It is possible that such radiation may be having a significant genetic effect on the population as a whole.

3. The Committee is fully aware of the importance and value of the medical use of radiations, but wishes to draw the attention of the medical profession to these facts and to the need for a more accurate estimate of the amount of exposure from this source. The help of the medical profession would be most valuable to make it possible to obtain fuller information on this subject.

4. The Committee would be particularly grateful for information through appropriate governmental channels on ways in which the medical irradiation of the population can be reduced without diminishing the true value of radiology in diagnosis or treatment.

[1] See the report of the International Commission on Radiological Protection, published in the *British Journal of Radiology*, Supplement 6, of December, 1954, in the *Journal français d'électro-radiologie*, No. 10, of October, 1955, *et cetera*.

[2] See the report of the International Commission on Radiological Protection, published in the *British Journal of Radiology*, Supplement 6, of December, 1954, in the *Journal français d'électro-radiologie*, No. 10, of October, 1955, *et cetera*.

[3] Sweden, United States of America.

[4] United Kingdom.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

D'ARCY WENTWORTH'S CORRESPONDENCE.[1]

DR. R. W. OWEN ex merchant ship Harriet to be Assistant Surgeon at 5/- per diem from 21.6.17.

W. Evans Assist Surgeon writes from Newcastle 24.6.1817 as the accident of 3rd March had deprived him of the use of his left hand he was unfit for duties of his situation but he hoped to be allowed to carry on for 6 months as he had affairs to settle.

30.6.17.

From 1.4.17.

Thomas Parmeter Assistant Surgeon to Asylum at Castle Hill (unsalaried) to be paid £30 p.a.

Henry Cowper Assistant in General Hospital unpaid to receive £25 p.a.

[1] From the original in the Mitchell Library, Sydney.

Correspondence.

NATIONAL HEALTH ACT, 1953-1956—PART VI: REGISTRATION OF ORGANIZATION.

SIR: We refer to the extract from the *Commonwealth of Australia Gazette*, Number 2 of January 10, 1957, setting out the names of registered hospital and medical benefits organizations, published in your journal on February 16, 1957.

Medical Benefits Fund of Australia Limited was listed as a registered hospital and medical benefits organization in New South Wales only, although it also has branches in Queensland and Tasmania.

It is desired to advise that the fund's registration under the *National Health Act*, 1953-56, covers its activities in all States.

We should be grateful if you would publish this fact in your journal at your earliest convenience.

Yours, etc.,

D. D. MACLARN,
A./Secretary.

Medical Benefits Fund of Australia Limited,
32 Jamison Street,
Sydney.
March 11, 1957.

EPISTEMOLOGY AND MEDICAL QUALIFICATION.

SIR: Apparently there is no editorial revision of your correspondence columns, or you surely would not have suffered the ludicrous mistakes and inaccuracies in Dr. Godfrey Harris's letter (M. J. AUSTRALIA, February 23, 1957).

For example, William Harvey, the discoverer of the circulation of the blood, was not a knight.

Lettsom did not found the Royal College of Physicians. This was done by Linacre in 1518, nearly three centuries before Lettsom was born. Lettsom's first names were John Coakley. Perhaps Dr. Harris, in naming him Isaac, is confusing him with the President of the United States of America, whose first name is Isaac. His name is spelt Lettsom, not Letsom, as Dr. Harris does. Lettsom had the degree of M.D. of the University of Leyden.

Sir Robert Jones and Hugh Owen Thomas were Fellows of the Royal College of Surgeons of England. Sir Alexander MacCormick was an M.D. of the University of Edinburgh and an Honorary Fellow of the English and of the Edinburgh College of Surgeons. Sir John McKelvey[1] spelt his name as such, and not as Dr. Harris does. Havelock Ellis was a Fellow of the Royal College of Physicians of London.

It is pleasant to observe that Dr. Harris's quotation from Shakespeare is correct.

Yours, etc.,

RAYMOND HENNESSY.

55 Collins Street,
Melbourne,
March 7, 1957.

A SPECIAL UNIT FOR CANCER RESEARCH IN NEW SOUTH WALES.

SIR: At the meeting of the State Cancer Council on February 20, 1957, the progress of the Special Unit for Investigation and Treatment was reviewed. The unit was working at full capacity, and pleasure was expressed at the cooperation given by the practitioners of New South Wales in the referral of suitable patients to the unit.

It was decided by Council that a communication be forwarded to the Editor of THE MEDICAL JOURNAL OF AUSTRALIA conveying the appreciation of Council and the Special Unit for this cooperation, and expressing the hope that it would continue.

Yours, etc.,

B. T. EDYE,
On behalf of the New South Wales State Cancer Council.

"Craignish",
185 Macquarie Street,
Sydney.
March 7, 1957.

THE FLUORIDATION OF WATER SUPPLIES.

SIR: In a pamphlet from California entitled "Fluoridation Unmasked" the following statement about myself appears:

> Professor R. A. Peters, Biochemist of Oxford, England, says: "Fluoroacetic acid prevents the body from breaking down the citric acid created when sugar is burned into simpler compounds. Retention of waste citric acid acts as a violent poison on heart and nervous system. Fluoroacetic acid is used by African natives to murder their enemies. What will happen to the person drinking fluoridated water when he uses vinegar?" (acetic acid).

I do not know upon what writing of mine this is supposed to be based, but I think it as well to point out that it gives entirely the wrong impression. Inorganic fluoride acts completely differently in the body from fluoroacetic acid, in which the carbon is linked firmly to the fluorine. Fluoroacetic acid is a rat poison which is much more toxic than fluoride. The suggestion in the last sentence that fluoride and acetic acid will combine easily to form fluoroacetic acid is very wide of the truth. It is in fact quite difficult to synthesize fluoroacetic acid, and certainly there is no evidence that it can happen in the body; furthermore, acetic acid (vinegar), if given early enough, is an antidote to fluoroacetic acid poisoning in some animals.

Yours, etc.,

R. A. PETERS.

Agricultural Research Council Institute of Animal Physiology (Biochemistry Department),
Babraham, Cambridge,
England.
January 17, 1957.

[1] The mistake in the spelling of Sir John McKelvey's name was made in the journal office. It is regretted.—EDITOR.

Obituary.

FREDERICK WILLIAM CARTER.

FREDERICK WILLIAM CARTER died at his home in Perth on December 13, 1956. In his lifetime he had served his patients and his profession with energy, sincerity and skill; he had forged strong friendships and won the regard of his colleagues; he had held firmly to what he believed to be the highest good. He left a proud memory.

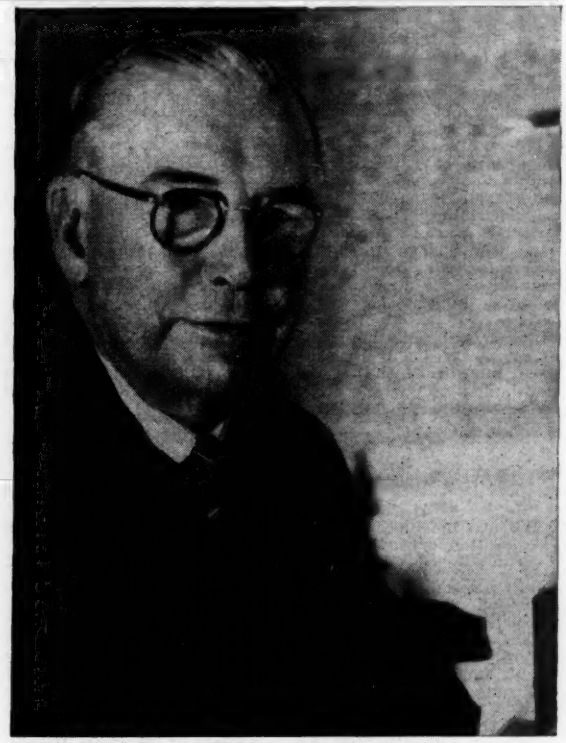
Fred Carter was born in Melbourne on February 22, 1883, and moved to Western Australia in 1896. He qualified in pharmacy on February 28, 1905, and became an outstandingly successful pharmaceutical chemist in Perth. His pharmaceutical knowledge was to stand him and the medical profession in good stead many years later. However, he had ambitions to enter the medical profession; so he gave up his interest in pharmacy and went abroad to Aberdeen, where he qualified in medicine and surgery at the University in 1917. He saw service in the Royal Army Medical Corps in the latter part of the first World War, and returned to Australia in 1919. He entered general practice and built up an extensive and important connexion at Leederville.

In those earlier days he played no great part in the affairs of the British Medical Association, but occasionally he would appear and, in a discussion which interested him, would gain the greatest respect for the manner in which he presented his material, usually in medico-political matters. His incursions into the medical politics of the Western Australian Branch gradually became more frequent, but whilst they established in the minds of his colleagues the fact that he had the ability to lead and direct the thoughts of the profession, they did not at that time bring him into close association with the majority. In fact, one of his friends has stated that one sensed almost an atmosphere of aloofness existing between him and many members of the profession. Another friend has pointed out that he had a considerable amount of Irish in him, and dearly loved an argument, although the fireworks would die down readily enough if one waited patiently. However, he was as straight as one can be made and hated back-door methods. His word was his bond. He had a keen sense of humour and was very quick at repartee. Moreover, he had a very orderly brain and could quickly and lucidly sort anything out and put it down in a logical form. When the time came for him to be proposed as a member of the Council of the Western Australian Branch, there was some concern in the minds of the executive at the time about whether or not he would prove acceptable to the profession. However, he was elected unopposed to the Council, and served as the President of the Branch in the following year.

His great opportunity to serve the profession came when the National Health Insurance Bill was before the House of Representatives. He then assumed the position of one of the leaders of the medical profession in its fight for the preservation of the principles of practice which had become traditional. He spared himself in no manner in his efforts to serve his colleagues, and it became immediately apparent that in Fred Carter the profession had a leader of great stature, and one in whom it could trust implicitly. This was true not only in the Western Australian Branch, but in the Federal Council, on which he served, first as a proxy in 1937 and 1938, and then as a full member from 1939 to 1953. The full story of his part in the fight against the National Health Insurance scheme and again some ten years later against another national health scheme that was not acceptable to the profession has been told in a separate tribute by Dr. W. F. Simmons.

By now accepted by his colleagues, Fred Carter had himself accepted the responsibilities and cares of leadership with untiring devotion to their interests; and their dependence on him now increased to such an extent that he seemed almost to be expected to give up his restricted leisure in order to assist them in the matters in which they were vitally interested. Individual members of the profession came to him continually for advice and help. His service on the Federal Council from 1939 to 1953 was, as has already been indicated, outstanding, but it took great toll of his strength, and by 1953 it became necessary for him to withdraw from the activities which had become his very life blood. The members of the Western Australian Branch, realizing what he had done for them, made him a life Vice-President in 1953, an honour given to very few members of the Branch. He made light of the serious illnesses which affected him in the last decade of his life, and his friends considered that he should have retired long before he did. He gave up

practice only because he just could not carry on. However, even when his physical condition had forced him into retirement, he continued to take an active interest in the affairs of his profession, and the esteem and affection in which he had come to be held by his colleagues, his patients and others in the community grew and flourished. With his passing, Australia has lost one of her finest medical sons, who served in the ranks of general practice throughout his medical career, but became a leader of the whole profession. A colleague in Western Australia states that a profession which at first was inclined to some indifference towards him came to a trust and reliance on him which had perhaps never before been seen in that State. With the rapid expansion in numbers in the profession in Western Australia in the post-war period, many may not even know of Fred Carter, but all will be affected by his work on their behalf.



Fred Carter's association with this journal and with the Australasian Medical Publishing Company Limited was long and fruitful. As the Editor's representative in Western Australia he gave willing and useful service from 1940 to 1949. On April 30, 1950, he was elected a member of the Australasian Medical Publishing Company Limited by the Western Australian Branch. From May 20, 1950, till his death he was a Director of the Company.

The following is an extract from a minute adopted by the Council of the Western Australian Branch of the British Medical Association at a meeting on February 6, 1957:

> That Branch Council place on record its deep appreciation of the constant and unremitting work of the late Dr. Fred Carter on behalf of the medical profession. These efforts were often made at great sacrifice, of time, energy and personal finance.
>
> He was elected to the Branch Council in March, 1935, and served continuously thereafter until his death in January of this year. He became President of the Western Australian Branch in 1937.
>
> With the advent of the Federal Government's proposals to introduce National Health Insurance in 1938-39 he became indefatigable in his efforts to secure a measure of justice for his fellow practitioners. At this time night after night was occupied in committee meetings and visits were made to the Eastern States to Federal Committee meetings and as a proxy delegate to the Federal Council itself. His obvious sincerity, his tenacity of purpose and his capacity to present his point of view so lucidly were readily recognized and acclaimed, and in 1939 he was elected to the Federal Council of which he remained a member until forced to retire through ill-health at the end of 1952. In 1948 at the height of the controversy with the Chifley Government regarding its proposals to introduce a pharmaceutical service which would have restricted the rights and infringed the liberties of the profession, he suffered his first coronary thrombosis. On recovery he fought doggedly on, in spite of frequent attacks of chest pain, for another four years, but at last he was forced to relinquish his Federal duties.
>
> In June, 1953, in recognition of his great services, he was made the first Permanent Vice-President of this Branch and was presented with some silver plate as a mark of the high regard in which he was held by his fellow doctors and of their very sincere appreciation of all that he had done for them.
>
> Such is a brief and very inadequate account of his great labours on our behalf. It makes no mention of the innumerable committees of which he was a prominent member, particularly of the Contract Practice Committee. It tells nothing of his painstaking work as a trustee of the Protection of Practices Committee, set up to protect the practices of members on service during the Second World War and to assist in their rehabilitation on their return.
>
> Moreover it tells us nothing of his work as a doctor in West Leederville or of his activities outside the British Medical Association; of his service overseas during the First World War; of his activities as a prominent member of the Methodist Church; of his interest in bowls and his efforts as President of the Western Australian Bowling Association in the days before medico-politics claimed his time; of his ardent love of music and his extensive library of recordings; or of the manner of man he was with his keen sense of the ludicrous which revealed itself from time to time.

We honour the memory of Fred Carter and offer our sympathy to his wife and daughter in their bereavement.

DR. W. F. SIMMONS writes: In 1937 Sir Frederick Stewart, Federal Minister for Health, returned to Australia full of enthusiasm for the National Health Service of Great Britain, which provided for all workers a medical service on a capitation basis. This scheme, which provided an ordinary general practitioner service, did not cover the worker's dependants, but covered only employed persons. The Government was so impressed by Sir Frederick's advocacy of the scheme that early in 1938 it invited Sir Walter Kinnear, a very senior official in the British Ministry of Health, to visit Australia and advise the Government on the possible introduction of the scheme or one very similar to it for the workers in Australia.

The Federal Council of the British Medical Association in Australia, which acts on behalf of the Branches in all matters which concern Commonwealth Government policy and the profession, awaited with interest Sir Walter's report. The Federal Council met in Adelaide in August, 1937, and at this meeting Dr. F. W. Carter acted as proxy for Dr. D. M. McWhae. In 1938 the Kinnear proposals were made public and were fully discussed by all the Branches; the unanimous decision was made that they were unacceptable to the profession and unfair to the workers, whose dependants were unprovided for. The capitation system and the rate offered by the Government would make it impossible to provide a good service to the insured persons and a reasonable living for the profession. In 1938 five meetings of the Federal Council and of its special National Health Insurance Committee were held in Melbourne, Sydney or Canberra, and at each of these Fred Carter acted as Dr. McWhae's proxy. In those days air travel was not comfortable, and on several occasions the Western Australian delegates had to travel by train. Carter, who was the leader in the General Practitioner Section of the Western Australian Branch, impressed all members of the Federal Council with his reasoned arguments, his sincerity and his knowledge of the bad points in the British scheme, which he had discovered while doing "locum" work in England after World War I.

In 1939 Dr. McWhae did not seek reelection to the Federal Council, and Dr. Carter was appointed to the vacancy. While the Royal Commission appointed by the Commonwealth to inquire into the reasons for the profession's opposition to the Kinnear scheme was travelling around Australia, Dr.

Carter headed the Western Australian team which prepared facts and figures to support the profession's case. He gave the Commission most valuable information and was most helpful to counsel appearing for the profession. In the strenuous days of 1938 and early 1939 the work of the Secretariat was colossal, and so a large amount of information passed between members of the Federal Council and its committee members by private correspondence. These letters gave the members in the various States an idea of what members in other States felt and what was the reaction of the practising profession to the policy of the Government and to that of the Federal Council. In those days Western Australia always seemed very far away from the eastern States, but by these letters the gap was narrowed and we became one big family. Fred Carter was an excellent letter-writer: he typed all his letters in duplicate; he marshalled his facts, stated his case, invited criticism and awaited the replies of his correspondents with eagerness; and he neatly filed these letters, so that he could always have them at hand when needed. The hours of voluntary service he gave to the Federal Council, to various committees, to addressing meetings and to correspondence would be impossible to estimate.

Fred Carter was a man to inspire confidence. He held the view that principles were the foundation on which to build policy. He was frankly honest and despised political expediency. He felt that going to the profession, telling them the whole story and inviting criticism, did more to win their confidence and loyalty than any other method of approach.

In 1939 World War II suddenly loomed, and all thought of insurance schemes was laid on one side; the national need was all that mattered. Carter immediately threw himself into the job of organizing ways and means of helping the families of men who volunteered to serve their country in any theatre of war. The Trust Fund established he managed to the complete satisfaction of his colleagues and those entitled to its help. For four years the profession gave no thought to anything but war. The Federal Council during those years did lay down some fundamental principles on which it felt a national health service could be built, but those principles were temporarily stored in its archives and kept there till a more convenient season.

Imagine the surprise of the Federal Council when, in December, 1943, during the height of the war, we were summoned to Canberra to hear for the first time the Government's plan for the first stage of its national health service—a free pharmaceutical service of formulary design limited in scope and by Treasury allotment. This scheme just infuriated Carter. For some years prior to his going to Aberdeen to study medicine he had owned and managed a first-class pharmacy in Perth, where drugs only of the highest quality were sold, and where dispensing accuracy had won for him and his pharmacy the great respect of the public and the medical profession. Anything cheap and slovenly dispensed was anathema to him. Carter's advice was invaluable to the profession, and it can be definitely stated that he very largely helped in leading the opposition by the whole profession to this "free medicine scheme".

From then onwards a large amount of the work of the Federal Council concerned organized opposition to the national health service which was then the policy of the Government. Carter as an elder statesman in Western Australia helped to mould the policy which had lain in cold storage since the early war years into something which would be acceptable to the people of Australia and to the new Government, which had promised that there would be no conscription of the medical profession.

When in June, 1950, Sir Earle Page addressed the Federal Council in Brisbane about his concept of what a national health scheme should be, Carter was not easy to convince, because he felt that at that time the Minister's scheme was something which he, the Minister, had in his head, but which none of us actually understood. Carter insisted that before we could accept anything from any government, it should be set down in black and white and allow of only one interpretation. He was certainly right, and the Federal Council supported him. It was at this Brisbane Congress that Carter had a very severe attack of influenza, which I feel severely damaged his myocardium. For the next two years his physical weakness gradually increased, and at the end of 1952 he asked the Western Australian Branch to appoint a successor. He continued for a while as a very valuable member of the Pharmaceutical Benefits Advisory Committee appointed by the Commonwealth Government, but then the strain of travel told on him and he had to give up work.

He continued to be a director of the Australasian Medical Publishing Company Limited until he passed away. He made a superhuman effort to attend the directors' meeting in Sydney in August, 1955, immediately prior to the Ninth Session of the Australasian Medical Congress (British Medical Association), but on the day prior to the opening of the Congress he had a grave coronary attack and had to remain in Sydney for two months before he was fit to travel home. From then onwards until his end he put up a valiant fight worthy of the man himself, until on that December morning the call came: "Well done, good and faithful servant: enter thou into the joy of thy Lord."

Fred Carter was my friend, and no man ever had a finer one. His loyalty, his high principles, his boyish love of a joke, his family life and his dealings with his patients and his colleagues leave a memory which can never be effaced. I was honoured by being among the select few who shared his confidence.

Western Australia has lost a great citizen and the medical profession its "Elder Statesman".

SIR HENRY NEWLAND writes: When Dr. F. W. Carter was elected to the Federal Council as a representative of the Western Australian Branch of the British Medical Association, I was President of that body. He was soon to prove himself one of the Council's most able members and debaters. Since my retirement from the Council I have had the privilege and pleasure of again being associated with him on the Board of Directors of the Australasian Medical Publishing Company Limited, of which he was a member at the time of his death. The responsibilities we have shared and the friendship I have valued over the years entitle me to testify to Carter's merits. He was a gifted and industrious man who strove to make himself well informed before expressing his views on any subject. He was an ideal councillor. He was wont to be patient and delay his contribution to a discussion or debate until most of his colleagues had had their say. His lucid and logical phrasing coupled with his sincerity rarely failed to impress his listeners. We shall miss him greatly. I and my colleagues, too, I am sure, feel that the epithet "sterling" conveys best the quality of Carter's character and personality. We shall remember him.

BRONTE SMEATON.

WE are indebted to Dr. G. A. Lendon for the following appreciation of the late Dr. Bronte Smeaton.

Bronte Smeaton was born on October 6, 1873, at Medindie, South Australia. He was the second son of Thomas Drury Smeaton, an English engineer who had taken up banking on his arrival in Australia, subsequently becoming manager of the now defunct Bank of South Australia. Many have inquired about the Christian name, Bronte, and how it came about, for it has been fairly extensively copied in South Australia. Actually there was no "Nelson Touch" about it; the parents agreed that each should have the right to name the children of the opposite sex. Mrs. Smeaton, a somewhat romantic lady, was a devotee of Charlotte Bronte; but Mr. Smeaton, a prosaic engineer turned banker, decided to use the vowels A, E, I, O, U in order, and each successive daughter's name began with a vowel. However, a plethora of sons prevented him from getting beyond the letter "I".

Bronte Smeaton was educated at Byard's and Prince Alfred College, and took his M.B., B.S., Adelaide, in 1896, sharing top place with Henry Newland, thereby gaining the Everard Scholarship. This year he rowed for Adelaide in the University eight. The Adelaide Hospital disagreement caused a tremendous disruption of the young medical school; Bronte's year were the last to qualify before the storm broke, and no more local graduates were accepted as residents. So he went to Port Augusta, where there was a hospital, and from there, out into the outback to Wilgena, where he attended to the birth of the elder brother of Dr. A. S. de B. Cocks, now on the senior staff of the Royal Adelaide Hospital. Going to England, Bronte Smeaton did post-graduate work at the London Hospital, and held resident posts at Saint Mark's Hospital and Saint Peter's Hospital, where he was house surgeon to the celebrated Sir Peter Freyer, who had been dismissed from the Indian Medical Service for accepting a fee of a lac of rupees for relieving the obstructed bladder of a rajah. Bronte was not impressed by his chief, and always said of him that if he feared that the prostate was malignant, he would pass the case over to a rival. Returning in 1899, he went to Murray Bridge and practised there until 1901, when he was appointed Medical Superintendent of the Adelaide Hospital, a post he held until 1904. He was married twice, the second

time, in 1904, to Miss Josephine Wigley, who survives him, as do three of his four children. The eldest, Dr. Creagh Smeaton, died a few years ago; Bronte was very fond of his somewhat wayward elder son, and terribly cut up over his two accidents—the first a fall over a cliff when Bronte was away at the first World War, resulting in a fracture of the dorsal segment of the spine and an alleged traumatic coarctation of the aorta, and the second, when a car door slammed and gouged out his eye. This caused him (Creagh) to forsake surgery and practise radiology. In 1904, Bronte Smeaton commenced practice at Mount Barker, remaining there until he was appointed Assistant Surgeon to the Adelaide Hospital in 1910, when he returned to town, living first in Tynte Street, then in Barton Terrace, and finally in Palmer Place. He did not get on to the senior surgical staff until 1925, retiring in 1933 at the age of sixty. Smeaton enlisted in 1915 and made a voyage to Egypt in the hospital ship *Karoola*; he returned to Adelaide and made a further voyage, this time to England. Dr. Gordon Craig was in command, and amongst fellow officers were Dr. W. W. S. Johnston and Dr. Brook Lewis; the former always insists that Bronte was the life and soul of the party. One of the more colourful personalities on board was Dr. J. A. G. Hamilton, senior gynæcologist at the Adelaide Hospital. As he was stone deaf (a fact that each of his students was expected to prove by exploding a paper bag just behind his head whilst he was operating), and well into his sixties, it can be imagined that his presence on board did little to alter the course of the war; but Bronte was never tired of relating "Jag's" clashes with authority, for he insisted upon wearing the highly coloured headgear of some Irish regiment in which he had served in his youth on top of his Australian Imperial Force uniform. Smeaton was posted to Number 2 Australian General Hospital at Abbeville, and returned to Adelaide just before the termination of hostilities, owing to his son's accident. He was president of the South Australian Branch of the British Medical Association in 1921, and South Australia representative on the Federal Council from 1924 to 1935, when he retired in favour of Dr. Edmund Britten Jones.

So quickly does one become forgotten on retiring that I was not surprised to find, on talking to some of the younger doctors, that Bronte Smeaton was only a name to them; so it may be advisable to speculate upon those traits which made him a prominent figure in medicine forty years ago. His outstanding quality was his honesty, a medical attribute which was not so unusual or remarkable when he was in his prime, but one which would now single him out as a beacon amongst the lesser lights of modern commercial practice—a development which always filled him with horror when he heard about it. In many autobiographies one reads that the subject did not suffer fools gladly; Bronte did not suffer them at all. He was one of the most witty individuals I have ever known, comparable even with Professor F. Wood Jones in this respect, and his outspoken comments on those he did not like inevitably got back to the persons concerned in a small town like Adelaide, with the result that a number of hard things were also said about him—the difference being in the supreme wit and absolute truth of Bronte's remarks. One has often wondered whether the notorious "wisecracker" thinks up his witticisms in advance, and has a store of them ready for the occasion; but I had frequent evidence that Bronte's remarks were spontaneous. Many of the victims of these sallies are still living, and I am thereby prevented from recounting the real plums.

He was a man of many stories, and right up to the end of his life an excellent *raconteur*. I think that skill in this art is based upon the individual's ability to see the humour, pathos *et cetera* in an ordinary situation, where it would pass unnoticed by the average man. The reputation for exaggeration and fabrication which becomes attached to any celebrated story-teller is not only a fallacy, but largely due to the jealousy of his rivals, who neither see humour in a commonplace situation, nor have the ability to describe it succinctly, and this is where Bronte scored. I first met him professionally when I was a fourth year student attached as a dresser to his surgical out-patient department, the term "unit" being unknown at that time. Little did I think that eight years later we would be corresponding assistant surgeon and physician at the same out-patient session. I can still remember that first day I worked for him, and even recall some of the things he said. In those days the honorary assistant physicians and surgeons seemed to vie with one another in rudeness to their patients, and everyone accepted it as part of hospital life. Medical students are usually portrayed as being singularly devoid of finer feelings, and I was presumably no exception; but I was truly amazed at the manners of these middle-aged men at their work, for I had met them all at my father's home on North Terrace, and the change was astounding. I would not say that Bronte was "soft" with his out-patients; but that first day with him I learned that it was possible to manage a troublesome neurotic with firmness and dignity, and without the slightest display of rudeness. Looking back, I am quite sure that the contrast between Bronte and some of his colleagues had a tremendous influence upon me. I have always thought that "behaviour" in front of medical students is the most important part of medical teaching; in fact, it was about all the physicians had to offer, prior to World War I. In my later associations with him, and they were many, I was continually impressed with his diagnostic ability, especially in two departments, the "chronic abdomen" and the detection of the malingerer. When I first knew him, a surgical consultation at the

Adelaide Hospital would consist of a perfunctory abdominal prodding and the inevitable substitute for a diagnosis: "Put him down on Friday's list"; and in my house physician phase, I was struck by the relative care with which Bronte took the history and examined the patient. Of his surgery I am not so qualified to speak; I think that it was sound, without being as brilliant or adventurous as was that of his main colleagues and rivals. That he was aware of his limitations in this respect, and again as witness to his honesty of purpose, I remember him calling in a surgeon twenty-five years his junior, to operate, whilst he assisted, upon a broncho-pleural fistula, in the days before thoracic surgery became a specialty. At the time of his honorary service, there were no surgical specialties apart from eyes, ear, nose and throat, and gynæcology, so that his interest in genito-urinary surgery was really a hobby; but it led to his being the recognized authority in this branch of surgery. When he practised at Mount Barker, he was responsible for most of the surgery between that town and the River Murray, and so became very experienced in the vagaries of hydatid disease. I think he was the first to point out that this infestation practically stopped at Mount Barker, and his practical knowledge of veterinary work led him to the explanation. At and near the Murray, the butchers killed and dressed their carcasses over running water, letting the offal drift away—a fact also appreciated by the local canine population, who retrieved the infested organs. One of the appointments which interested Smeaton most was that of veterinary representative on the Council of the newly formed Institute of Medical and Veterinary Science; but many of

his most useful ideas for the improvement of our local veterinary service, based upon his wide knowledge of farming, were passed over as being too revolutionary. Although he did not contribute to medical literature, and spoke infrequently at clinical gatherings, he was intensely interested in medicine and all its ramifications. After he had retired he was a frequent visitor to my medical wards in the late afternoons, and on Sunday mornings, and it was at this period of his life that I came to recognize the value of his vast experience. He was said not to keep notes of his cases, relying upon his extraordinary memory—a contrast to my father, whose voluminous notes, or anyway the "tasty" portions, were all written in Greek. Medical education was on a very different basis in the "nineties", when the honoraries and students were all very well acquainted with each other, and there were more honoraries than students. Although they worked very hard, the generation of doctors who were established before the advent of the motor-car led a more cultured life than their successors; and what incredible changes they were privileged to witness, both in medicine and in world affairs! Yet, to one who remembers the horse and brougham days, the advent of the motor-car surely appears to have altered medical practice more than any of the new therapeutic advances. It is still possible, in Adelaide, to gauge roughly the order in which the medical families turned over to petrol, at least any after the first 120, who were all allotted numbers on the same day; Bronte Smeaton was the one hundred and thirty-sixth car owner in South Australia. Many others, in these notices, have stressed the medical innovations witnessed by those who die in their eighties; I should like to contrast the apparent cast-iron security of the professional classes in the latter part of Victoria's reign with their present uneasy prosperity under the shadow of the atomic weapons. Smeaton's generation saw the slow disintegration of this pleasant status accelerated by two world wars, culminating in the last great event before Bronte died, the closure of the Suez Canal. This tragedy was too much for him; the last time I saw him he kept referring to it. To the man in the street it seems unbelievable; to an Australian who had served in Egypt in World War I it was the last straw.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Primary F.R.A.C.S. Tutorial Course, 1957.

The Post-Graduate Committee in Medicine in the University of Sydney announces that a tutorial course, suitable for the Primary F.R.A.C.S. examination, will be held on Wednesday afternoons from April 10 to August 21, 1957.

The programme will cover ten tutorials in anatomy by Dr. R. D. Condon, and five tutorials in pathology by Dr. J. P. O'Brien. Tutorials in physiology will cover the following subjects: nervous system, Dr. J. L. Allsop; digestive system and metabolism, Dr. B. P. Billington; endocrines, Dr. P. F. Hall; cardio-vascular system, chest, and kidney and electrolytes, Dr. Peter Harvey.

The fee for attendance is £26 5s., and those wishing to attend are requested to make written application, enclosing remittance, to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney. Telephones: BU 4497-8. Telegraphic address: "Postgrad Sydney."

Course in Anæsthesia for General Practitioners.

The Post-Graduate Committee in Medicine in the University of Sydney announces that a course in anæsthesia will be conducted by the Department of Anæsthetics and Resuscitation at Sydney Hospital for two weeks from November 18 to 29, 1957. The course will be a full-time one, from 9 a.m. to 6 p.m. daily, consisting of practical demonstrations and tutorials.

Enrolments will be limited to three, and applicants should submit particulars of their anæsthetic experience and requirements. The closing date for applicants is June 30, 1957, and the selection of candidates will be announced shortly after this date. The fee for attendance is £12 12s., payable after selection date. Written application, enclosing full particulars, should be sent to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney. Telephones: BU 5535, BU 4497-8. Telegraphic address: "Postgrad Sydney."

Naval, Military and Air Force.

APPOINTMENTS.

The following appointments, changes *et cetera* are promulgated in the *Commonwealth of Australia Gazette*, Number 12, of February 28, 1957.

Australian Military Forces.

Australian Regular Army.

Royal Australian Army Medical Corps (Medical).

The Short Service Commission granted to 3/40109 Captain (Temporary Major) A. O. Donald is extended until 23rd December, 1958.

3/40054 Captain J. H. Cater relinquishes the provisional rank of Major, 2nd March, 1957.

To be Temporary Major, 3rd March, 1957: 3/40054 Captain J. H. Cater.

Citizen Military Forces.

Northern Command.

Royal Australian Army Medical Corps (Medical).—The following officers are appointed from the Reserve of Officers, and to be Captains (provisionally): Honorary Captains 1/33165 D. Robertson, 30th October, 1956, and 1/39197 N. F. Langley, 31st December, 1956.

The provisional rank of 1/39185 Captain R. L. Hockin is confirmed. 1/39193 Honorary Captain B. T. O'Sullivan is appointed from the Reserve of Officers, and to be Captain (provisionally), 27th November, 1956. The provisional appointments of the following officers are terminated: Captains 1/55673 G. F. Dixon, 8th February, 1956, 1/39164 I. R. Ferguson, 17th August, 1956, and 1/39131 B. S. Purssey, 14th November, 1956. To be Captains (provisionally): 1/55673 Grahame Frank Dixon, 9th February, 1956, 1/39164 Ian Ross Ferguson, 18th August, 1956, and 1/39131 Brian Swan Purssey, 15th November, 1956. The following officers are seconded whilst undergoing post-graduate studies in the United Kingdom: Captains (provisionally) 1/39164 I. R. Ferguson, 18th August, 1956, and 1/39131 B. S. Purssey, 15th November, 1956.

1/39189 Major V. E. Sampson, M.C., is appointed to command 11th Field Ambulance, and to be Temporary Lieutenant-Colonel, 1st January, 1957. 1/43715 Lieutenant-Colonel T. R. Biggs relinquishes command 11th Field Ambulance, 31st December, 1956, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Northern Command), 1st January, 1957. The provisional appointment of 1/66025 Captain R. M. Goodwin is terminated, 9th March, 1956. To be Captain (provisionally), 10th March, 1956: 1/66025 Robert Molesworth Goodwin.

Eastern Command.

Royal Australian Army Medical Corps (Medical).—2/766388 Honorary Captain A. R. Buhagiar is appointed from the Reserve of Officers and to be Captain (provisionally), 4th January, 1957.

2/127892 Captain G. W. Burgess is seconded whilst undergoing post-graduate studies in the United Kingdom, 1st October, 1956. The provisional appointment of 2/127051 Captain I. H. E. Dawson is terminated, 14th October, 1956. 2/130111 Captain (provisionally) J. A. Jaconelli relinquishes the provisional rank of Captain, is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Eastern Command), and is granted the honorary rank of Captain, 18th November, 1956. To be Captains (provisionally): 2/127051 Ian Henry Edward Dawson, 15th October, 1956, 2/183744 Harold Anthony Fisher, 20th December, 1956, and 2/137503 Richard Tennant Finch, 10th January, 1957.

2/56833 Captain (provisionally) B. S. Hartnett relinquishes the provisional rank of Captain and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps) (Medical)) (Eastern Command) in the honorary rank of Captain, 23th November, 1956.

Southern Command.

Royal Australian Army Medical Corps (Medical).—3/101034 Honorary Captain R. A. Williams is appointed from the Reserve of Officers, and to be Captain (provisionally), 18th December, 1956. To be Captain (provisionally), 23rd January, 1957: 3/101036 Harold Dean Breidahl.

To be Captain (provisionally), 19th December, 1956: 3/742654 Kenneth Edmund Stuchbery.

3/101030 Captain (provisionally) J. D. H. Muir relinquishes the provisional rank of Captain, and is transferred to the Reserve of Officers (Royal Australian Army Medical Corps (Medical)) (Southern Command), in the honorary rank of Captain, 11th December, 1956.

Central Command.

Royal Australian Army Medical Corps (Medical).—To be Captain (provisionally), 23rd January, 1957: 4/32087 Cobin Croucher.

To be Captains (provisionally), 21st December, 1956: 4/32084 Frank Stewart Smith and 4/32085 Zigurds Seglenieks.

4/32015 Captain (provisionally) W. D. Proudman is seconded whilst in the United Kingdom, 7th December, 1956. 4/32052 Honorary Captain J. R. Richards is appointed from the Reserve of Officers, and to be Captain (provisionally), 1st January, 1957. The provisional appointments of the following officers are terminated, 6th December, 1956: Captains 4/32015 W. D. Proudman, 4/32062 H. W. Welch, 4/32067 G. L. Mellor, 1/61847 R. M. Gray and 3/101020 D. N. Hawkins. To be Captains (provisionally), 7th December, 1956: 4/32015 William David Proudman, 4/32062 Howard Walter Welch, 4/32067 Geoffrey Lloyd Mellor, 1/61847 Ronald McKay Gray and 3/101020 David Nicholson Hawkins.

Tasmania Command.

Royal Australian Army Medical Corps (Medical).—The provisional appointments of the following officers are terminated: Captains 6/15255 P. C. Pitt, 12th March, 1956, 6/15269 R. G. Smith, 1st December, 1956, and 6/15263 D. E. Anderson, 14th January, 1957. To be Captains (provisionally): 6/15255 Peter Charles Pitt, 13th March, 1956, 6/15269 Robert Gordon Smith, 2nd December, 1956, and 6/15263 Donald Edmund Anderson, 15th January, 1957. The following officers are seconded whilst undergoing post-graduate studies in the United Kingdom: Captains (provisionally) 6/15269 R. G. Smith, 2nd December, 1956, and 6/15263 D. E. Anderson, 15th January, 1957.

Reserve Citizen Military Forces.

Royal Australian Army Medical Corps (Medical).

Northern Command.—To be Honorary Captain, 23rd January, 1957: John Robertson Unwin.

Eastern Command.—To be Honorary Captain, 3rd January, 1957: Anthony Roland Buhagiar.

Southern Command.—To be Honorary Captain, 7th January, 1957: Robert Gregory Birrell.

Northern Command.—To be Honorary Captains: John Powell Waller, 28th December, 1956, and Hubert Rodney Withers, 31st December, 1956.

Australian Medical Board Proceedings.

QUEENSLAND.

THE following have been registered, pursuant to the provisions of *The Medical Acts*, 1939 to 1955, as duly qualified medical practitioners registered under Section 19 (1) of the Act (in each case the qualification is M.B., B.S., 1955 (Univ. Queensland), unless otherwise stated): Paterson, John Russell; Shepherd, Vincent Bernard; Bailey, Raymond William Hyde; Byrne, Thomas Vincent; Kolb, Neville Richard; Edwards, John Edwards; Gaffney, Thomas Joseph; Magee, Harold Reginald; Brumm, Terence Higgins; Short, Noel Virgil; Burke, Brian Vincent; Murphy, Miles Ellis Beirne; Armbruster, Mary Neville; Hillcoat, Brian Leslie; Johansson, May Shirley; Hickey, Margaret Ann; Rogers, Rodney Carl; Brand, David Jollie; Harvey, Maxwell Melrose; Thatcher, Thomas John; Duke, Stanley Rowland; Stafford, Miriam; Brookes, Ronald Alfred, M.B., B.S., 1955 (Univ. Sydney); Meehan, Arthur Vincent Kenney, M.R.C.S., L.R.C.P. (London), 1954, M.B., B.S., 1955 (Univ. Queensland); Hagger, Thomas Dudley, M.B., B.S., 1930 (Univ. Melbourne), M.D., 1933 (Univ. Melbourne); Bulman, John Gould, M.B., Ch.B., 1948 (Univ. Edinburgh); Carter, Jeannette Jill, M.B., B.S., 1956 (Univ. Sydney); Ramrakha, Ramchandra, M.B., B.S., 1956 (Univ. Sydney); Martin, Kevin Dominic Francis, M.B., B.S., 1954 (Univ. London), M.R.C.S. (England), L.R.C.P. (London), 1955; Dickson, John Grant, M.B., B.S., 1944 (Univ. Sydney), D.L.O., R.C.P. (London), R.C.S. (England), 1954.

The following additional qualifications have been registered: Windrum, Graham Melrose, M.C.P.A., 1956; Squires,

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED MARCH 9, 1957.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	1	2	9(3)	..	..	..	..	..	12
Amoebiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	1(1)	..	..	..	..	..	1
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	1	..	..	..	..	..	..	1
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	..	..	..	..	..
Dengue	..	..	..	..	..	..	..	..	..
Diarrhoea (Infantile)	6(4)	12(12)	5(5)	..	..	..	..	..	23
Diphtheria	5(3)	..	..	..	..	..	..	..	5
Dysentery (Bacillary)	..	2(2)	4(1)	..	..	..	1	..	7
Encephalitis	1	..	..	..	..	..	..	..	1
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	1(1)	..	..	..	..	..	..	1
Infective Hepatitis	72(27)	27(16)	..	3(1)	3(1)	3(1)	..	1	109
Lead Poisoning	..	..	1	..	..	..	..	..	1
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	..	..	..	..	..	..	..
Malaria	..	..	3	..	..	..	..	..	3
Meningococcal Infection	1	2	..	..	..	..	..	..	3
Ophthalmia	..	..	..	..	..	..	..	..	..
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	4(1)	..	1	1	1	..	..	..	6
Puerperal Fever	..	..	..	..	..	..	..	..	1
Rubella	..	19(13)	..	11(8)	2(2)	..	..	..	32
Salmonella Infection	..	..	..	..	..	..	..	..	..
Scarlet Fever	6(3)	4(2)	2(1)	2(1)	3(2)	..	..	..	17
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	..	..	..	..	..	..	..
Trachoma	..	..	..	..	14	..	..	..	14
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	36(15)	6(5)	4(1)	8(5)	5(2)	3(2)	1	..	63
Typhoid Fever	1	..	..	..	..	..	..	..	1
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	..	..	..	..	..
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

John Charles, M.C.P.A., 1956; McLean (*née* Richards), Shirley Maud, D.A., R.C.S., London, 1955; Robinson, Ray Dudley, D.A., 1951 (Univ. Sydney), F.F.A., R.A.C.S., 1956; Watson, Jeffrey George, F.R.C.S. (England), 1953; Schubert, Frederick, D.C.R.A., 1956; Derrick, Edward Holbrook, M.C.P.A., 1956; Davison, Alan, M.C.P.A., 1956.

Notice.

BRITISH MEDICAL ASSOCIATION (NEW SOUTH WALES BRANCH).

Special Group of Neurology and Psychiatry.

THE Special Group of Neurology and Psychiatry of the New South Wales Branch of the British Medical Association will hold a clinical evening at the Northcott Neurological Centre, 11 Lytton Street, North Sydney, on Thursday, April 4, 1957, at 8 p.m. All medical practitioners are welcome.

Section of Occupational Medicine: A Correction.

We have been asked to publish the following correction relating to the meeting of the Section of Occupational Medicine, which was announced in the New South Wales Branch monthly bulletin of March 18, 1957. This meeting is to be a conjoint meeting of the Section of Occupational Medicine with the College of General Practitioners. It will be held, as stated, on April 4, 1957, in the William H. Crago Council Chamber, British Medical Association House, 135 Macquarie Street, Sydney; but the time will be 8.30 p.m., not 7.30 p.m.

The College of General Practitioners.

VICTORIA FACULTY.

ALL general practitioners in Victoria are invited to attend an opening meeting of the Victoria Faculty of the College of General Practitioners, to be held at the Medical Society Hall, Albert Street, East Melbourne, on Wednesday, April 10, 1957, at 8.15 p.m. Films of medical interest will be shown, and a short address will be given by Dr. R. Walmer Weaver, Provost of the Faculty, on the aims and objectives of the College.

University Intelligence.

THE UNIVERSITY OF SYDNEY.

Visiting Professor of Pharmacology.

THE Senate of the University of Sydney has appointed Professor J. M. Robson as the 1957 Visiting Professor of Pharmacology.

Professor Robson is Professor of Pharmacology at Guy's Hospital Medical School, London. He is joint author of "Recent Advances in Pharmacology", and is an active research worker in chemotherapy, particularly in connexion with tuberculosis.

Professor Robson will leave for Australia early in April and return via the United States early in June. During his stay in Australia he will lecture in Sydney and other capital cities, and will visit the Australian National University in Canberra.

The Senate of the University of Sydney wishes to acknowledge the assistance of the pharmaceutical manufacturers of Australia, by which a fund has been established to invite a guest professor in this subject each year.

Nominations and Elections.

THE undermentioned has applied for election as a member of the Victorian Branch of the British Medical Association:

Mayne, Frederick John, M.R.C.S., L.R.C.P. (London), 1927, Thorpdale Road, Trafalgar, Victoria.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Wurfel, Lois Jessie, M.B., B.S., 1954 (Univ. Adelaide), 20 Jarvis Street, Erindale, South Australia.

Kennedy, Desmond Anthony, M.B., B.S., 1954 (Univ. Adelaide), Box 33, Post Office, Laura, South Australia.

McDonald, John Gregory, M.B., B.S., 1955 (Univ. Adelaide), 22 Broadway, Glenelg, South Australia.

Fenna, Lois Rosemary, M.B., Ch.B., 1955 (Univ. Manchester), 2 Shrewton Court, Salisbury, South Australia.

The undermentioned have been elected as members of the South Australian Branch of the British Medical Association: Robertson, Christopher Lumley, M.B., B.S., qualified 1956 (Univ. Adelaide); Evans, Lloyd Lindsay Carey, M.B., B.S., qualified 1956 (Univ. Adelaide); Betheras, Frank Rex, M.B., B.S., qualified 1956 (Univ. Adelaide); Daniels, Brian William, M.B., B.S., qualified 1956 (Univ. Adelaide); Smith, Donald Stevenson, M.B., B.S., qualified 1956 (Univ. Adelaide); Chew, Chong Kan, M.B., B.S., qualified 1956 (Univ. Adelaide); Martin, Arthur Bruce, M.B., B.S., 1955 (Univ. Adelaide); Turner, Thomas William, M.B., B.S., 1955 (Univ. Adelaide); McEachern, Rita Margaret, M.B., B.S., 1926 (Univ. Adelaide); Schwartz, Colin John, M.B., B.S., 1954 (Univ. Adelaide); Nicholls, Margaret Phillipa, M.B., B.S., 1942 (Univ. Adelaide).

Diary for the Month.

APRIL 2.—New South Wales Branch, B.M.A.: Council Meeting.
APRIL 3.—Western Australian Branch, B.M.A.: Branch Council.
APRIL 3.—Victorian Branch, B.M.A.: Branch Meeting.
APRIL 4.—South Australian Branch, B.M.A.: Council Meeting.
APRIL 5.—Queensland Branch, B.M.A.: General Meeting.
APRIL 9.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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